A STREET & SMITH PUBLICATION

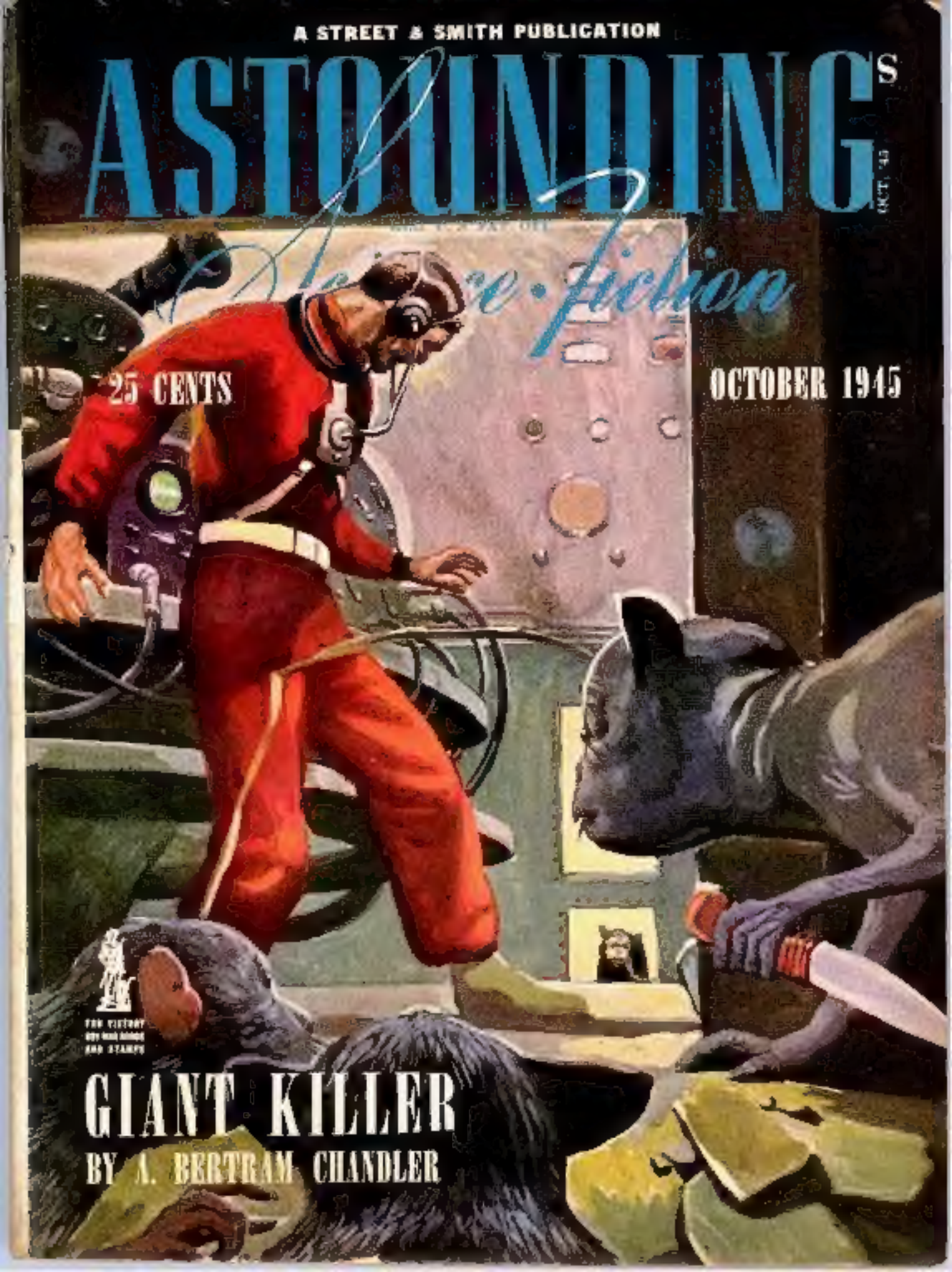
ASTOUNDING

OCT. '45

Science-fiction

25 CENTS

OCTOBER 1945



GIANT KILLER

BY A. BERTRAM CHANDLER

Why one husband kissed his wife four times!

Here's a kiss for the money you're saving...while it's coming in faster through the the war years. I know in my bones jobs like mine may not last forever. Who can tell what's going to happen day-after-tomorrow? Thank God you've got sense enough to see that today's the time to get a little money tucked away.

Here's a kiss for the War Bonds you're making me hold on to! I'd never do it without you, honey; it's too easy to find reasons for cashing 'em in—but when it comes time to put the children through school or pay for an emergency operation, we'll be thankful.

Here's a kiss for the insurance you talked me into buying. I've felt a lot easier ever since I've known our future is protected—you and the kids would be safe if anything happened to me—you and I won't have to spend our old age living on someone's charity. And every cent we put in insurance or War Bonds or other savings helps keep prices down.

and

Here's a kiss for being *you*—a woman with brains enough in your pretty head to make sure we don't buy a single thing we *don't* need in times like these—because you know a crazy wave of spending in wartime would march America straight into inflation. Baby, I sure knew how to pick 'em the day I married you!

A United States War message prepared by the War Advertising Council; approved by the Office of War Information; and contributed by this magazine in cooperation with the Magazine Publishers of America.

ONE PERSON CAN START IT!

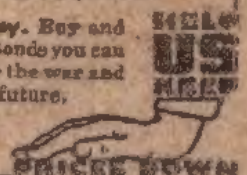
You give inflation a boost

—when you buy anything you can do without

—when you buy above ceiling or without giving up stamps (Black Market)

—when you ask more money for your services or the goods you sell.

Save your money. Buy and hold all the War Bonds you can afford—to pay for the war and protect your own future. Keep up your insurance.



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ASTOUNDING SCIENCE FICTION

Reg. U. S. Pat. Off.

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Illustrations by Orban and Williams

Editor
JOHN W. CAMPBELL, JR.

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$2.50 per Year in U.S. A. Printed in [redacted] to the U. S. A. 25c per Copy

NEXT ISSUE ON SALE OCTOBER 16, 1945

Eyewitness Account

Herewith a letter received from Jerry Shelton. We last heard from him regarding the difficulties of handling vacuums—since then he's been otherwise engaged, as his letter shows.

The letter:

Dear John:

A few weeks ago I talked to a kid in the infantry that has been getting some copies of Astounding over here and he told me that there were several letters in Brass Tacks in answer to that knocked-out letter I wrote in about how to make and drill and shape vacuums. He said George O. Smith really had a terrific twist on that stuff and addressed the letter to me. Tell George I'm sorry I was a trifle too isolated and busy here in Germany to answer, which brings up the reason for this letter.

I just scrounged a tattered copy of the May issue and the article about the V-2. I don't know whether you have had any letters from Astounding readers that have sweated those things out, but I think I have an interesting idea to offer that comes from personal observation. I am not speaking about your own personal feelings of fear and close hits and all that stuff as I'm sure the papers must have had plenty of that from other guys. Naturally, when we first were dodging the V-1's and with all the censorship on them, it was nerve-wracking to be constantly saying to yourself: "How about this? Here I am running around in a sweat trying to dodge something all us science-fiction guys have been writing and dreaming of—it's actually a reality—and I'm on the wrong end, and I can't write and tell Campbell that somebody is really on the way to space!" Honest—I think that I was more sore about that than anything else. Anyhow, about this V-2.

The USO Camp Show that I had organized was a combat unit and we worked close to the lines with the infantry and armor. One night, about 2200, just as we first got some armor on German soil—this was September just outside of Aachen—I was slowly feeling my way along a dirt road in darkness that you could cut with a knife. The artillery fire was spasmodic, and the shells overhead were making those sighing noises they make when they are your own out-going mail. I was pretty tense at the time as I was expecting a challenge from the guards who should be somewhere around the point I was approaching—and those men were plenty trigger-happy at that time—when suddenly, low on the horizon, about twenty degrees, I saw an oblong glow of light. It was sort of red-yellow. Now I have seen

hundreds of doodlebugs—V-1's—in the sky at night, and although they go pretty fast, they really seem to loaf along because of their height. But I knew instantly it wasn't a V-1. It wasn't a burning plane, or a flare—it wasn't anything I had ever seen before and it was moving at *terrific* speed, and I could sense that it was at a tremendous height. I couldn't hear a sound. And as it went over I subconsciously noted the time to be about fifteen seconds for it to pass over and then vanish at about twenty degrees off the horizon in the distance. It didn't come down and I never heard the explosion nor did I hear any sound of its passage overhead even after it passed me.

I know you have heard you can't see or hear a V-2. O.K., you can't see one in the daytime, but you can at night if you are lucky. You *can* hear one if it hits close and you art still alive, *after* the explosion. But here is the thing that stunned me about watching its passage. It wasn't like the artists draw a smooth curving line of flight. (Regarding rocket spaceships.) That thing was *wavering and quivering from a straight line* in short and sharp hard jerks. The closest I can come would be if you tried to draw a straight line swiftly on a piece of paper in a fast-moving vehicle riding over a very rough road.

Now how about this? It's been bothering me. Naturally at the speed of the V-2, compressibility of air is a big factor and the air is going to naturally refuse to slip by smoothly. How about asking Brass Tacks readers what they think about this?

If this is true, John, don't you think men are going to get a few teeth shaken out—instead of those famous lines like: ". . . and the gleaming ship dropped swiftly into the atmosphere, boring a clean smooth hole through the, et cetera, et cetera?—Jerry Shelton.

As to the jerky wavering, I suspect that V-2, a highly imperfect, rush-job weapon of bankruptcy was as full of bugs as the usual first working model of an involved technical device. Since the combustion chamber of the V-2 is fed by multiple fuel jets, I suspect that the feed is irregular, unstable, and extremely erratic. Any reaction so violent as the incomparably furious continuous-explosion effect going on in that combustion chamber—they are burning fuel at a rate of tons in seconds—is bound to set up sound-frequency resonances, shock-waves, and eddies that represent harmonics of the natural cavity-resonance periods possible in the combustion chamber. All of these factors lead to irregular thrust.

I am trying to get hold of a photograph of the smoke trail left by a V-2 in flight. I believe one has been taken; if possible, I hope to run it next month. In the meantime—comments, gentlemen?

The Editor.

Giant Killer

by

A. BERTRAM CHANDLER

We've read of mutant supermen, of strange and alien races on other worlds. But never have we had a tale of quite so homely, yet so utterly alien a race, nor of quite such a super-mutant. Chandler has a yarn to tell—

Illustrated by Orban

Shrick should have died before his baby eyes had opened on his world. Shrick would have died, but Weena, his mother, was determined that he, alone of all her children should live. Three previous times since her mating with Skreer had she borne, and on each occasion the old, gray Sterrett, Judge of the Newborn, had condemned her young as Different Ones.

Weena had no objection to the Law when it did not affect her or hers. She, as much as any other member of the Tribe, keenly enjoyed the feasts of fresh, tasty meat following the ritual slaughter of the Different Ones. But when those sacrificed were the fruit of her own womb it wasn't the same.

It was quiet in the cave where Weena awaited the coming of her

lord. Quiet, that is, save for the sound of her breathing and an occasional plaintive, mewling cry from the newborn child. And even these sounds were deadened by the soft spongy walls and ceiling.

She sensed the coming of Skreer long before his actual arrival. She anticipated his first question and, as he entered the cave, said quietly, "One. A male."

"A male?" Skreer radiated approval. Then she felt his mood change to one of questioning, of doubt. "Is it . . . he—?"

"Yes."

Skreer caught the tiny, warm being in his arms. There was no light, but he, like all his race, was accustomed to the dark. His fingers told him all that he needed to know. The child was hairless. The legs were too straight. And—this was worst of all—the head was a great, bulging dome.

"Skreer!" Weena's voice was anxious. "Do you—?"

"There is no doubt. Sterret will condemn it as a Different One."

"But—"

"There is no hope." Weena sensed that her mate shuddered, heard the faint, silken rustle of his fur as he did so. "His head! He is like the Giants!"

The mother sighed. It was hard, but she knew the Law. And yet—This was her fourth child-bearing, and she was never to know, perhaps, what it was to watch and wait with mingled pride and terror whilst her sons set out with the other young males to raid the Giants' territory, to bring back spoils from the great Cave-of-Food, the Place-of-Green-Growing-Things or, even, precious scraps of shiny metal from the Place of Life-That-Is-Not-Life.

She clutched at a faint hope.

"His head is like a Giant's? Can it be, do you think, that the Giants are Different Ones? I have heard it said."

"What if they are?"

"Only this. Perhaps he will grow to be a Giant. Perhaps he will fight the other Giants for us, his own people. Perhaps—"

"Perhaps Sterrett will let him live, you mean." Skreer made the short, unpleasant sound that passed among his people for a laugh. "No, Weena. He must die. And it is long since we feasted—"

"But—"

"Enough. Or do *you* wish to provide meat for the Tribe also? I may wish to find a mate who will bear me sturdy sons, not monsters!"

The Place-of-Meeting was almost deserted when Skreer and Weena, she with Shrick clutched tightly in her arms, entered. Two more couples were there, each with newborn. One of the mothers was holding two babies, each of whom appeared to be normal. The other had three, her mate holding one of them.

Weena recognized her as Teeza, and flashed her a little half smile of sympathy when she saw that the child carried by Teeza's mate would certainly be condemned by Sterret when he choose to appear. For it was, perhaps, even more revolting than her own Different

One, having two hands growing from the end of each arm.

Skreer approached one of the other males, he unburdened with a child.

"How long have you been waiting?" he asked.

"Many heartbeats. We—"

The guard stationed at the doorway through which light entered from Inside hissed a warning:

"Quiet! A Giant is coming!"

The mothers clutched their children to them yet more tightly, their fur standing on end with superstitious dread. They knew that if they remained silent there was no danger, that even if they should betray themselves by some slight noise there was no immediate peril. It was not size alone that made the Giants dreaded, it was the supernatural powers that they were known to possess. The food-that-kills had slain many an unwary member of the Tribe, also their fiendishly cunning devices that crushed and mangled any of the People unwise enough to reach greedily for the savory morsels left exposed on a kind of little platform. Although there were those who averred that, in the latter case, the risk was well worth it, for the yellow grains from the many bags in the Cave-of-Food were as monotonous as they were nourishing.

"The Giant has passed!"

Before those in the Place-of-Meeting could resume their talk, Sterret drifted out from the entrance of his cave. He held in his right hand his wand of office, a straight staff of the hard, yet soft, stuff dividing the territory of the People from that of the Giants. It was tipped with a sharp point of metal.

He was old, was Sterret.

Those who were themselves grandparents had heard their grandparents speak of him. For generations he had survived attacks by young males jealous of his prerogatives as chief, and the more rare assaults by parents displeased by his rulings as Judge of the Newborn. In this latter case, however, he had had nothing to fear, for on those isolated occasions the tribe had risen as one and torn the offenders to pieces.

Behind Sterret came his personal guards and then, floating out from the many cave entrances, the bulk of the Tribe. There had been no need to summon them; they *knew*.

The chief, deliberate and unhurried, took his position in the center of the Place-of-Meeting. Without orders, the crowd made way for the parents and their newborn. Weena winced as she saw their gloating eyes fixed on Shrick's revolting baldness, his misshapen skull. She knew what the verdict would be.

She hoped that the newborn of the others would be judged before her own, although that would merely delay the death of her own child by the space of a very few heartbeats. She hoped—

"Weena! Bring the child to me that I may see and pass judgment!"

The chief extended his skinny arms, took the child from the

mother's reluctant hands. His little, deep-set eyes gleamed at the thought of the draught of rich, red blood that he was soon to enjoy. And yet he was reluctant to lose the savor of a single heartbeat of the mother's agony. Perhaps she could be provoked into an attack—

"You insult us," he said slowly, "by bringing forth *this!*" He held Shrick, who squalled feebly, at arm's length. "Look, oh People, at this *thing* the miserable Weena has brought for my judgment!"

"He has a Giant's head," Weena's timid voice was barely audible. "Perhaps—"

"—his father was a Giant!"

A tittering laugh rang through the Place-of-Meeting.

"No. But I have heard it said that perhaps the Giants, or their fatheas and mothers, were Different Ones. And—"

"Who said that?"

"Strela."

"Yes, Strela the Wise. Who, in his wisdom, ate largely of the food-that-kills!"

Again the hateful laughter rippled through the assembly.

Sterret raised the hand that held the spear, shortening his grip on the haft. His face puckered as he tasted in anticipation the bright bubble of blood that would soon well from the throat of the Different One. Weena screamed. With one hand she snatched her child from the hateful grasp of the chief, with the other she seized his spear.

Sterret was old, and generations of authority had made him careless. Yet, old as he was, he evaded the vicious thrust aimed at him by the mother. He had no need to cry orders, from all sides the People converged upon the rebel.

Already horrified by her action, Weena knew that she could expect no mercy. And yet life, even as lived by the Tribe, was sweet. Gaining a purchase from the gray, spongy floor of the Place-of-Meeting she jumped. The impetus of her leap carried her up to the doorway through which streamed the light from Inside. The guard there was unarmed, for of what avail would a puny spear be against the Giants? He fell back before the menace of Weena's bright blade and bared teeth. And then Weena was Inside.

She could, she knew, hold the doorway indefinitely against pursuit. But this was Giant country. In an agony of indecision she clung to the rim of the door with one hand, the other still holding the spear. A face appeared in the opening, and then vanished, streaming with blood. It was only later that she realized that it had been Skreer's.

She became acutely conscious of the fierce light beating around and about her, of the vast spaces on all sides of a body that was accustomed to the close quarters of the caves and tunnels. She felt naked and, in spite of her spear, utterly defenseless.

Then that which she dreaded came to pass.

Behind her, she sensed the approach of two of the Giants. Then

she could hear their breathing, and the low, infinitely menacing rumble of their voices as they talked one with the other. They hadn't seen her—of that she was certain but it was only a matter of heartbeats before they did so. The open doorway, with the certainty of death that lay beyond, seemed infinitely preferable to the terror of the unknown. Had it been only her life at stake she would have returned to face the righteous wrath of her chief, her mate and her Tribe.

Fighting down her blind panic, she forced herself to a clarity of thought normally foreign to her nature. If she yielded to instinct, if she fled madly before the approaching Giants, she would be seen. Her only hope was to remain utterly still. Skreer, and others of the males who had been on forays Inside, had told her that the Giants, careless in their size and power, more often than not did not notice the People unless they made some betraying movement.

The Giants were very close.

Slowly, cautiously, she turned her head.

She could see them now, two enormous figures floating through the air with easy arrogance. They had not seen her, and she knew that they would not see her unless she made some sudden movement to attract their attention. Yet it was hard not to yield to the impulse to dive back into the doorway to the Place-of-Meeting, there to meet certain death at the hands of the outraged Tribe. It was harder still to fight the urge to relinquish her hold on the rim of the doorway and flee—anywhere—in screaming panic.

But she held on.

The Giants passed.

The dull rumble of their voices died in the distance, their acrid, unpleasant odor, of which she had heard but never before experienced, diminished. Weena dared to raise her head once more.

In the confused, terrified welter of her thoughts one idea stood out with dreadful clarity. Her only hope of survival, pitifully slim though it was, lay in following the Giants. There was no time to lose, already she could hear the rising clamor of voices as those in the caves sensed that the Giants had passed. She relinquished her hold on the edge of the door and floated slowly up.

When Weena's head came into sudden contact with something hard she screamed. For long seconds she waited, eyes close shut in terror, for the doom that would surely descend upon her. But nothing happened. The pressure upon the top of her skull neither increased nor diminished.

Timidly, she opened her eyes.

As far as she could see, in two directions, stretched a long, straight shaft or rod. Its thickness was that of her own body, and it was made, or covered with, a material not altogether strange to the mother. It was like the ropes woven by the females with fibers from the Place-of-Green-Growing-Things—but incomparably finer. Stuff such as this

was brought back sometimes by the males from their expeditions. It had been believed, once, that it was the fur of the Giants, but now it was assumed that it was made by them for their own purposes.

On three sides of the shaft was the glaring emptiness so terrifying to the people of the caves. On the fourth side was a flat, shiny surface. Weena found that she could insinuate herself into the space between the two without discomfort. She discovered, also, that with comforting solidity at her back and belly she could make reasonably fast progress along the shaft. It was only when she looked to either side that she felt a return of her vertigo. She soon learned not to look.

It is hard to estimate the time taken by her journey in a world where time was meaningless. Twice she had to stop and feed Shrick—fearful lest his hungry wailings betray their presence either to Giants or any of the People who might—although this was highly improbable—have followed her. Once she felt the shaft vibrating, and froze to its matt surface in utter and abject terror. A Giant passed, pulling himself rapidly along with his two hands. Had either of those hands fallen upon Weena it would have been the finish. For many heartbeats after his passing she clung there limp and helpless, scarcely daring to breath.

It seemed that she passed through places of which she had heard the males talk. This may have been so—but she had no means of knowing. For the world of the People, with its caves and tunnels, was familiar territory, whilst that of the Giants was known only in relation to the doorways through which a daring explorer could enter.

Weena was sick and faint with hunger and thirst when, at last, the long shaft led her into a place where she could smell the tantalizing aroma of food. She stopped, looked in all directions. But here, as everywhere in this alien country, the light was too dazzling for her untrained eyes. She could see,

dimly, vast shapes beyond her limited understanding. She could see no Giants, nor anything that moved.

Cautiously, keeping a tight hold on the rough surface of the shaft, she edged out to the side away from the polished, flat surface along which she had been traveling. Back and forth her head swung, her sensitive nostrils dilated. The bright light confused her, so she shut her eyes. Once again her nose sought the source of the savory smell, swinging ever more slowly as the position was determined with reasonable accuracy.

She was loathe to abandon the security of her shaft, but hunger overruled all other considerations. Orienting her body, she jumped. With a thud she brought up against another flat surface. Her free hand found a projection, to which she clung. This she almost relinquished as it turned. Then a crack appeared, with disconcerting suddenness, before her eyes, widening rapidly. Behind this opening was black, welcome darkness. Weena slipped inside, grateful for relief from the glaring light of the Inside. It wasn't until later that she realized that this was a door such as was made by her own people in the Barrier, but a door of truly gigantic proportions. But all that mattered at first was the cool, refreshing shade.

Then she took stock of her surroundings.

Enough light came in through the barely open doorway for her to see that she was in a cave. It was the wrong shape for a cave, it is true, having flat, perfectly regular walls and floor and ceiling. At the far end, each in its own little compartment, were enormous, dully shining globes. From them came a smell that almost drove the famishing mother frantic.

Yet she held back. She knew that smell. It was that of fragments of food that had been brought into the caves, won by stealth and guile from the killing platforms of the Giants. Was this a killing platform? She wracked her brains to recall the poor description of these devices given by the males, decided that this, after all, must be a Cave-of-Food. Relinquishing her hold of Shrick and Sterrett's spear she made for the nearest globe.

At first she tried to pull it from its compartment, but it appeared to be held. But it didn't matter. Bringing her face against the surface of the sphere she buried her teeth in its thin skin. There was flesh beneath the skin, and blood—a thin, sweet, faintly acid juice. Skreer had, at times, promised her a share of this food when next he won some from a killing platform, but that promise had never been kept. And now Weena had a whole cave of this same food all to herself.

Gorged to repletion, she started back to pick up the now loudly complaining Shrick. He had been playing with the spear and had cut himself on the sharp point. But it was the spear that Weena snatched, swinging swiftly to defend herself

and her child. For a voice said, understandable, but with an oddly slurred intonation, "Who are you? What are you doing in our country?"

It was one of the People, a male. He was unarmed, otherwise it is certain that he would never have asked questions. Even so, Weena knew that the slightest relaxation of vigilance on her part would bring a savage, tooth and nail attack.

She tightened her grasp on the spear, swung it so that its point was directed at the stranger.

"I am Weena," she said, "of the Tribe of Sterrett."

"Of the Tribe of Sterrett? But the Tribe of Sessa holds the ways between our countries."

"I came Inside. But who are you?"

"Tekka. I am one of Skarro's people. You are a spy."

"So I brought my child with me."

Tekka was looking at Shrick.

"I see," he said at last. "A Different One. But how did you get through Sessa's country?"

"I didn't. I came Inside."

It was obvious that Tekka refused to believe her story.

"You must come with me," he said, "to Skarro. He will judge."

"And if I come?"

"For the Different One, death. For you, I do not know. But we have too many females in our Tribe already."

"This says that I will not come." Weena brandished her spear.

She would not have defied a male of her own tribe thus—but this Tekka was not of her people. And she had always been brought up to believe that even a female of the Tribe of Sterrett was superior to a male—even a chief—of any alien community.

"The Giants will find you here." Tekka's voice showed an elaborate unconcern. Then— "That is a fine spear."

"Yes. It belonged to Sterrett. With it I wounded my mate. Perhaps he is dead."

The male looked at her with a new respect. If her story were true—this was a female to be handled with caution. Besides—

"Would you give it to me?"

"Yes." Weena laughed nastily. There was no mistaking her meaning.

"Not that way. Listen. Not long ago, in our Tribe, many mothers, two whole hands of mothers with Different Ones, defied the Judge of the Newborn. They fled along the tunnels, and live outside the Place-of-Little-Lights. Skarro has not yet led a war party against them. Why, I do not know, but there is always a Giant in that place. It may be that Skarro fears that a fight behind the Barrier would warn the Giants of our presence—"

"And you will lead me there?"

"Yes. In return for the spear."

Weena was silent for the space of several heartbeats. As long as Tekka preceded her she would be safe. It never occurred to her that she could let the other fulfill his part of the bargain, and then refuse him his payment. Her people were

a very primitive race.

"I will come with you," she said.

"It is well."

Tekka's eyes dwelt long and lovingly upon the fine spear. Skarro would not be chief much longer.

"First," he said, "we must pull what you have left of the good-to-eat-ball into our tunnel. Then I must shut the door lest a Giant should come—"

Together they hacked and tore the sphere to pieces. There was a doorway at the rear of one of the little compartments, now empty. Through this they pushed and pulled their fragrant burden. First Weena went into the tunnel, carrying Shrick and the spear, then Tekka. He pushed the round door into place, where it fitted with no sign that the Barrier had been broken. He pushed home two crude locking bars.

"Follow me," he ordered the mother.

The long journey through the caves and tunnels was heaven after the Inside. Here there was no light—or, at worst, only a feeble glimmer from small holes and cracks in the Barrier. It seemed that Tekka was leading her along the least frequented ways and tunnels of Skarro's country, for they met none of his people. Nevertheless, Weena's perceptions told her that she was in densely populated territory. From all around her beat the warm, comforting waves of the routine, humdrum life of the People. She knew that in snug caves males, females and children were living in cozy intimacy. Briefly she regretted having thrown away all this for the ugly, hairless bundle in her arms. But she could never return to her own Tribe, and should she wish to throw in her lot with this alien community the alternatives would be death or slavery.

"Careful!" hissed Tekka. "We are approaching Their country."

"You will—?"

"Not me. They will kill me. Just keep straight along this tunnel and you will find Them. Now, give me the spear."

"But—"

"*You* are safe. There is your pass." He lightly patted the uneasy, squirming Shrick. "Give me the spear, and I will go."

Reluctantly, Weena handed over the weapon. Without a word Tekka took it. Then he was gone. Briefly the mother saw him in the dim light that, in this part of the tunnel, filtered through the Barrier—a dim, gray figure rapidly losing itself in the dim grayness. She felt very lost and lonely and frightened. But the die was cast. Slowly, cautiously, she began to creep along the tunnel.

When They found her she screamed. For many heartbeats she had sensed their hateful presence, had felt that beings even more alien than the Giants were closing in on her. Once or twice she called, crying that she came in peace, that she was the mother of a Different One. But not even echo answered her, for the soft, spongy tunnel walls deadened the shrill sound of

her voice. And the silence that was not silence was, if that were possible, more menacing than before.

Without warning the stealthy terror struck. Weena fought with the courage of desperation, but she was overcome by sheer weight of numbers. Shrick, protesting feebly, was torn from her frantic grasp. Hands—and surely there were far too many hands for the number of her assailants—pinned her arms to her sides, held her ankles in a vice-like grip. No longer able to struggle she looked at her captors. Then she screamed again. Mercifully, the dim light spared her the full horror of their appearance, but what she saw would have been enough to haunt her dreams to her dying day had she escaped.

Softly, almost caressingly, the hateful hands ran over her body with disgusting intimacy.

Then— "She is a Different One."

She allowed herself to hope.

"And the child?"

"Two-Tails has newborn. She can nurse him."

And as the sharp blade found her throat Weena had time to regret most bitterly ever having left her snug, familiar world. It was not so much the forfeit of her own life —that she had sacrificed when she defied Sterrett—it was the knowledge that Shrick, instead of meeting a clean death at the hands of his own people, would live out his life among these unclean monstrosities.

Then there was a sharp pain and a feeling of utter helplessness as the tide of her life swiftly ebbed —and the darkness that Weena had loved so well closed about her for evermore.

No-Fur—who, at his birth, had been named Shrick—fidgetted impatiently at his post midway along what was known to his people as Skarro's Tunnel. It was time that Long-Nose came to relieve him. Many heartbeats had passed since he had heard the sounds on the other side of the Barrier proclaiming that the Giant in the Place-of-Little-Lights had been replaced by another of his kind. It was a mystery what the Giants did there—but the New People had come to recognize a strange regularity in the actions of the monstrous beings, and to regulate their time accordingly.

No-Fur tightened his grip on his spear—of Barrier material it was, roughly sharpened at one end—as he sensed the approach of somebody along the tunnel, coming from the direction of Tekka's country. It could be a Different One bearing a child who would become one of the New People, it could be attack. But, somehow, the confused impressions that his mind received did not bear out either of these assumptions.

No-Fur shrank against the wall of the tunnel, his body sinking deep into the spongy material. Now he could dimly see the intruder—a solitary form flitting furtively through the shadows. His sense of smell told him that it was a female. Yet he was certain that she had no

child with her. He tensed himself to attack as soon as the stranger should pass his hiding place.

Surprisingly, she stopped

"I come in peace," she said. "I am one of you. I am," here she paused a little, "one of the New People."

Shrick made no reply, no betraying movement. It was barely possible, he knew, that this female might be possessed of abnormally keen eyesight. It was even more likely that she had smelled him out. But then—how was it that she had known the name by which the New People called themselves? To the outside world they were Different Ones—and had the stranger called herself such she would at once have proclaimed herself an alien whose life was forfeit.

"You do not know," the voice came again, "how it is that I called myself by the proper name. In my own Tribe I am called a Different One—"

"Then how is it," No-Fur's voice was triumphant, "that you were allowed to live?"

"Come to me! No, leave your spear. Now come!"

No-Fur stuck his weapon into the soft cavern wall. Slowly, almost fearfully, he advanced to where the female was waiting. He could see her better now—and she seemed no different from those fugitive mothers of Different Ones—at whose slaughter he had so often assisted. The body was well proportioned and covered with fine, silky fur. The head was well shaped. Physically she was so normal as to seem repugnant to the New People.

And yet—No-Fur found himself comparing her with the females of his own Tribe, to the disadvantage of the latter. Emotion rather than reason told him that the hatred inspired by the sight of an ordinary body was the result of a deep-rooted feeling of inferiority rather than anything else. And he wanted this stranger.

"No," she said slowly, "it is not my body that is different. It is in my head. I didn't know myself until a little while—about two hands of feeding—ago. But I can tell, now, what is going on inside your head, or the head of any of the People—"

"But," asked the male, "how did they—"

"I was ripe for mating. I was mated to Trillo, the son of Tekka, the chief. And in our cave I told Trillo things of which he only knew. I thought that I should please him, I thought that he would like to have a mate with magical powers that he could put to good use. With my aid he could have made himself chief. But he was angry—and very frightened. He ran to Tekka, who judged me as a Different One. I was to have been killed, but I was able to escape. They dare not follow me too far into this country—"

Then— "You want me."

It was a statement rather than a question.

"Yes. But—"

"No-Tail? She can die. If I fight her and win, I become your mate."

Briefly, half regretfully, No-Fur thought of his female. She had been patient, she had been loyal. But he saw that, with this stranger for a mate there were no limits to his advancement. It was not that he was more enlightened than Trillo had been, it was that as one of the New People he regarded abnormality as the norm.

"Then you will take me." Once again there was no hint of questioning. Then— "My name is Wesel."

The arrival of No-Fur, with Wesel in tow, at the Place-of-Meeting could not have been better timed. There was a trial in progress, a young male named Big-Ears having been caught red-handed in the act of stealing a coveted piece of metal from the cave of one Four-Arms. Long-Nose, who should have relieved No-Fur, had found the spectacle of a trial with the prospect of a feast to follow far more engrossing than the relief of the lonely sentry.

It was he who first noticed the newcomers.

"Oh, Big-Tusk," he called, "No-Fur has deserted his post!"

The chief was disposed to be lenient.

"He has a prisoner," he said. "A Different One. We shall feast well."

"He is afraid of you" hissed Wesel. *"Defy him!"*

"It is no prisoner." No-Fur's voice was arrogant. "It is my new mate. And you, Long-Nose, go at once to the tunnel."

"Go, Long-Nose. My country must not remain unguarded. No-Fur, hand the strange female over to the guards that she may be slaughtered."

No-Fur felt his resolution wavering under the stern glare of the chief. As two of Big-Tusk's bullies approached he slackened his grip on Wesel's arm. She turned to him, pleading and desperation in her eyes.

"No, no. He is afraid of you, I say. Don't give in to him. Together we can—"

Ironically, it was No-Tail's intervention that turned the scales. She confronted her mate, scorn written large on her unbeautiful face, the shrewish tongue dreaded by all the New People, even the chief himself, fast getting under way.

"So," she said, "you prefer this drab, common female to me. Hand her over, so that she may, at least, fill our bellies. As for you, my bucko, you will pay for this insult!"

No-Fur looked at the grotesque, distorted form of No-Tail, and then at the slim, sleek Wesel. Almost without volition he spoke.

"Wesel is my mate," he said. "She is one of the New People!"

Big-Tusk lacked the vocabulary to pour adequate scorn upon the insolent rebel. He struggled for words, but could find none to cover the situation. His little eyes gleamed redly, and his hideous tusks were bared in a vicious snarl.

"Now!" prompted the stranger. "His head is confused. He will be

rash. His desire to tear and maul will cloud his judgment. Attack!"

No-Fur went into the fight coldly, knowing that if he kept his head he must win. He raised his spear to stem the first rush of the infuriated chief. Just in time Big-Tusk saw the rough point and, using his tail as a rudder, swerved. He wasn't fast enough, although his action barely saved him from immediate death. The spear caught him in the shoulder and broke off short, leaving the end in the wound. Mad with rage and pain the chief was now a most dangerous enemy —and yet, at the same time, easy meat for an adversary who kept his head.

No-Fur was, at first, such a one. But his self-control was cracking fast. Try as he would he could not fight down the rising tides of hysterical fear, of sheer, animal blood lust. As the enemies circled, thrust and parried, he with his almost useless weapon, Big-Tusk with a fine, metal tipped spear, it took all his will power to keep himself from taking refuge in flight or closing to grapple with his more powerful antagonist. His reason told him that both courses of action would be disastrous—the first would end in his being hunted down and slaughtered by the Tribe, the second would bring him within range of the huge, murderous teeth that had given Big-Tusk his name.

So he thrust and parried, thrust and parried, until the keen edge of the chief's blade nicked his arm. The stinging pain made him all animal, and with a shrill scream of fury he launched himself at the other.

But if Nature had provided Big-Tusk with a fine armory she had not been niggardly with the rebel's defensive equipment. True, he had nothing outstanding in the way of teeth or claws, had not the extra limbs possessed by so many of his fellow New People. His brain may have been a little more nimble—but at this stage of the fight that counted for nothing. What saved his life was his hairless skin.

Time after time the chief sought to pull him within striking distance, time after time he pulled away. His slippery hide was crisscrossed with a score of scratches, many of them deep but none immediately serious. And all the time he himself was scratching and pummeling with both hands and feet, biting and gouging.

It seemed that Big-Tusk was tiring, but he was tiring too. And the other had learned that it was useless to try to grab a handful of fur, that he must try to take his enemy in an unbreakable embrace. Once he succeeded. No-Fur was pulled closer and closer to the slavering fangs, felt the foul breath of the other in his face, knew that it was a matter of heartbeats before his throat was torn out. He screamed, threw up his legs and lunged viciously at Big-Tusk's belly. He felt his feet sink into the soft flesh, but the chief grunted and did not relax his pressure. Worse—the failure of his desperate counterattack had brought No-Fur even closer to death.

With one arm, his right, he pushed desperately against the other's chest. He tried to bring his knees up in a crippling blow, but they were held in a vicelike grip by Big-Tusk's heavily muscled legs. With his free, left arm he flailed viciously and desperately, but he might have been beating against the Barrier itself.

The People, now that the issue of the battle was decided, were yelling encouragement to the victor. No-Fur heard among the cheers the voice of his mate, No-Tail. The little, cold corner of his brain in which reason was still enthroned told him that he couldn't blame her. If she were vociferous in *his* support, she could expect only death at the hands of the triumphant chief. But he forgot that he had offered her insult and humiliation, remembered only that she was his mate. And the bitterness of it kept him fighting when others would have relinquished their hold on a life already forfeit.

The edge of his hand came down hard just where Big-Tusk's thick neck joined his shoulder. He was barely conscious that the other winced, that a little whimper of pain followed the blow. Then, high and shrill, he heard Wesel.

"Again! Again! That is his weak spot!"

Blindly groping, he searched for the same place. And Big-Tusk was afraid, of that there was no doubt. His head twisted, trying to cover his vulnerability. Again he whimpered, and No-Fur knew that the battle was his. His thin, strong fingers with their sharp nails dug

and gouged. There was no fur here, and the flesh was soft. He felt the warm blood welling beneath his hand as the chief screamed dreadfully. Then the iron grip was abruptly relaxed. Before Big-Tusk could use hands or feet to cast his enemy from him No-Fur had twisted and, each hand clutching skin and fur, had buried his teeth in the other's neck. They found the jugular. Almost at once the chief's last, desperate struggles ceased.

No-Fur drank long and satisfyingly.

Then, the blood still clinging to his muzzle, he wearily surveyed the People.

"I am chief," he said.

"You are the chief!" came back the answering chorus.

"And Wesel is my mate."

This time there was hesitation on the part of the People. The new chief heard mutters of *"The feast . . . Big-Tusk is old and tough. . . . are we to be cheated—?"*

"Wesel is my mate," he repeated. Then— "There is your feast—"

At the height of his power he was to remember No-Tail's stricken eyes, the dreadful feeling that by his words he had put himself outside all custom, all law.

"Above the Law," whispered Wesel.

He steeled his heart.

"There is your feast," he said again.

It was Big-Ears who, snatching a spear from one of the guards, with one swift blow dispatched the cringing No-Tail.

"I am your mate," said Wesel.

No-Fur took her in his arms. They rubbed noses. It wasn't the old chief's blood that made her shudder ever so slightly. It was the feel of the disgusting, hairless body against her own.

Already the People were carving and dividing the two corpses and wrangling over an even division of the succulent spoils.

There was one among the New People who, had her differences from the racial stock been only psychological, would have been slaughtered long since. Her three eyes notwithstanding, the imprudent exercise of her gift would have brought certain doom. But, like her sisters in more highly civilized communities, she was careful to tell those who came to her only that which they desired to hear. Even then, she exercised restraint. Experience had taught her that foreknowledge of coming events on the part of the participants often resulted in entirely unforeseen results. This annoyed her. Better misfortune on the main stream of Time than well-being on one of its branches.

To this Three-Eyes came No-Fur and Wesel.

Before the chief could ask his questions the seeress raised one emaciated hand.

"You are Shrick," she said. "So your mother called you. Shrick, the Giant Killer."

"But—"

"Wait. You came to ask me about your war against Tekka's

people. Continue with your plans. You will win. You will then fight the Tribe of Sterret the Old. Again you will win. You will be Lord of the Outside. And then—"

"And then?"

"The Giants will know of the People. Many, but not all, of the People will die. You will fight the Giants. And the last of the Giants you will kill, but he will plunge the world into— Oh, if I could make you see! But we have no words."

"What—?"

"No, you cannot know. You will never know till the end is upon you. But this I can tell you. The People are doomed. Nothing you or they can do will save them. But you will kill those who will kill us, and that is good."

Again No-Fur pleaded for enlightenment. Abruptly, his pleas became threats. He was fast lashing himself into one of his dreaded fits of blind fury. But Three-Eyes was oblivious of his presence. Her two outer eyes were tight shut and that strange, dreaded inner one was staring at *something*, something outside the limits of the cave, outside the framework of things as they are.

Deep in his throat the chief growled.

He raised the fine spear that was the symbol of his office and buried it deep in the old female's body. The inner eye shut and the two outer ones flickered open for the last time.

"I am spared the End—" she said.

Outside the little cavern the faithful Big-Ears was waiting.

"Three-Eyes is dead," said his master. "Take what you want, and give the rest to the People—"

For a little there was silence.

Then— "I am glad you killed her," said Wesel. "She frightened me. I got inside her head—and I was lost!" Her voice had a hysterical edge. "I was lost! It was mad, mad. *What Was* was a *place*, a *PLACE*, and *Now*, and *What Will Be*. And I saw the End."

"What did you see?"

"A great light, far brighter than the Giants' lights Inside. And heat, stronger than the heat of the floors of the Far Outside caves and tunnels. And the People gasping and dying and the great light bursting into our world and eating them up—"

"But the Giants?"

"I did not see. I was lost. All I saw was the End."

No-Fur was silent. His active, nimble mind was scurrying down the vistas opened up by the dead prophetess. Giant Killer *Giant Killer*. Even in his most grandiose dreams he had never seen himself thus. And what was that name? Shrick? He repeated it to himself —Shrick the Giant Killer. It had a fine swing to it. As for the rest, the End, if he could kill the Giants then, surely, he could stave off the doom that they would mete out to the People. Shrick, the Giant Killer—

"It is a name that I like better than No-Fur," said Wesel.

"Shrick, Lord of the Outside.

Shrick, Lord of the World. Shrick, the Giant Killer—"

"Yes," he said, slowly. "But the End—"

"You will go through that door when you come to it."

The campaign against Tekka's People had opened.

Along the caves and tunnels poured the nightmare hordes of Shrick. The dim light but half revealed their misshapen bodies, limbs where no limbs should be, heads like something from a half forgotten bad dream.

All were armed. Every male and female carried a spear, and that in itself was a startling innovation in the wars of the People. For sharp metal, with which the weapons were tipped, was hard to come by. True, a staff of Barrier material could be sharpened, but it was a liability rather than an asset in a pitched battle. With the first thrust the point would break off, leaving the fighter with a weapon far inferior to his natural armory of teeth and claws.

Fire was new to the People—and it was Shrick who had brought them fire. For long periods he had spied upon the Giants in the Place-of-Little-Lights, had seen them bring from the pouches in their fur little, glittering devices from which when a projection was pressed, issued a tiny, naked light. And he had seen them bring this light to the end of strange, white sticks that they seemed to be sucking. And the end of the stick would glow, and there would be a cloud like the cloud that issued from the mouths of the People in some of the Far Outside caverns where it was very cold. But this cloud was fragrant, and seemed to be strangely soothing.

And one of the Giants had lost his little, hot light. He had put it to one of the white sticks, had made to return it to his pouch, and his hand had missed the opening. The Giant did not notice. He was doing something which took all his attention—and strain his eyes and his imagination as he might Shrick could not see what it was. There were strange glittering machines through which he peered intently at the glittering Little Lights beyond their transparent Barrier. Or were they on the inside of the Barrier? Nobody had ever been able to decide. There was something alive that wasn't alive that clicked. There were sheets of fine, white skin on which the Giant was making black marks with a pointed stick.

But Shrick soon lost interest in these strange rites that he could never hope to comprehend. All his attention was focused on the glittering prize that was drifting ever so slowly towards him on the wings of some vagrant eddy.

When it seemed that it would surely fall right into the doorway where Shrick crouched waiting it swerved. And, much as he dreaded the pseudo life that hummed and clicked, Shrick came out. The Giant, busy with his sorcery, did not notice him. One swift leap carried him to the drifting trophy. And then he had it, tight clasped to his

breast. It was bigger than he had thought, it having appeared so tiny only in relationship to its previous owner. But it wasn't too big to go through the door in the Barrier. In triumph Shrick bore it to his cave.

Many were the experiments that he, eager but fumbling, performed. For a while both he and Wesel nursed painful burns. Many were the experiments that he intended to perform in the future. But he had stumbled on one use for the hot light that was to be of paramount importance in his wars.

Aping the Giants, he had stuck a long splinter of Barrier material in his mouth. The end he had brought to the little light. There was, as he had half expected, a cloud. But it was neither fragrant nor soothing. Blinded and coughing, Wesel snatched at the glowing stick, beat out its strange life with her hands.

Then— "It is hard," she said. "It is almost as hard as metal—"

And so Shrick became the first mass producer of armaments that his world had known. The first few sharpened staves he treated himself. The rest he left to Wesel and the faithful Big-Ears. He dare not trust his wonderful new power to any who were not among his intimates.

Shrick's other innovation was a direct violation of all the rules of war. He had pressed the females into the fighting line. Those who were old and infirm, together with the old and infirm males, brought up the rear with bundles of the mass produced spears. The New People had been wondering for some little time why their chief had refused to let them slaughter those of their number who had outlived their usefulness. Now they knew.

The caves of the New People were deserted save for those few females with newborn.

And through the tunnels poured the hordes of Shrick.

There was little finesse in the campaign against Tekka's people. The outposts were slaughtered out of hand, but not before they had had time to warn the Tribe of the attack.

Tekka threw a body of picked spearmen into his van, confident that he, with better access to those parts of Inside where metal could be obtained, would be able to swamp the motley horde of the enemy with superior arms and numbers.

When Tekka saw, in the dim light, only a few betraying gleams of metal scattered among Shrick's massed spears he laughed.

"This No-Fur is mad," he said. "And I shall kill him with this." He brandished his own weapon. "His mother gave it to me many, many feedings ago."

"Is Wesel—?"

"Perhaps, my son. You shall eat her heart, I promise you."

And then Shrick struck.

His screaming mob rushed along the wide tunnel. Confident the Tekkan spearmen waited, knowing that the enemy's weapons were good for only one thrust, and that almost certainly not lethal.

Tekka scowled as he estimated

the numbers of the attackers. There couldn't be that many males among the New People. There couldn't— And then the wave struck.

In the twinkling of an eye the tunnel was tightly packed with struggling bodies. Here was no dignified, orderly, series of single combats such as had always, in the past, graced the wars of the People. And with growing terror Tekka realized that the enemy spears were standing up to the strain of battle at least as well as his own few metal-tipped weapons.

Slowly, but with ever mounting momentum, the attackers pressed on, gaining impetus from the many bodies that now lay behind them. Gasping for air in the effluvium of sweat and newly shed blood Tekka and the last of his guards were pressed back and ever back.

When one of the New People was disarmed he fell to the rear of his own front line. As though by magic a fresh fighter would appear to replace him.

Then— "He's using females!" cried Trillo. "He's—"

But Tekka did not answer. He was fighting for his life with a four-armed monster. Every hand held a spear—and every spear was bright with blood. For long heartbeats he parried the other's thrusts, then his nerve broke. Screaming, he turned his back on the enemy. It was the last thing he did.

And so the remnant of the fighting strength of the Tribe of Tekka was at last penned up against one wall of their Place-of-Meeting. Surrounding them was a solid hemispere of the New People. Snarl was answered by snarl. Trillo and his scant half dozen guards knew that there was no surrender. All they could do was to sell their lives as dearly as possible.

And so they waited for the inevitable, gathering the last reserves of their strength in this lull of the battle, gasping the last sweet mouthfuls of air that they would ever taste. From beyond the wall of their assailants they could hear the cries and screams as the females and children, who had hidden in their caves, were hunted out and slaughtered. They were not to know that the magnanimous Shrick was sparing most of the females. They, he hoped, would produce for him more New People.

And then Shrick came, elbowing his way to the forefront of his forces. His smooth, naked body was unmarked, save by the old scars of his battle with Big-Tusk. And with him was Wesel, not a hair of her sleek fur out of place. And Big-Ears—but he, obviously, had been in the fight. With them came more fighters, fresh and eager.

"Finish them!" ordered Shrick.

"Wait!" Wesel's voice was imperative. "I want Trillo."

Him she pointed out to the picked fighters, who raised their spears—weapons curiously slender and light, too fragile for hand-to-hand combat. A faint hope stirred in the breasts of the last defenders.

"Now!"

Trillo and his guards braced themselves to meet the last rush. It never came. Instead, thrown

with unerring aim, came those sharp, flimsy spears, pinning them horribly against the gray, spongy wall of the Place-of-Meeting.

Spared in this final slaughter, Trillo looked about him with wide, fear-crazed eyes. He started to scream, then launched himself at the laughing Wesel. But she slipped back through the packed masses of the New People. Blind to all else but that hateful figure, Trillo tried to follow. And the New People crowded about him, binding his arms and legs with their strong cords, snatching his spear from him before its blade drank blood.

Then again the captive saw she who had been his mate.

Shamelessly, she was caressing Shrick.

"My Hairless One," she said. "I was once mated to *this*. You shall have his fur to cover your smooth body." And then— "Big-Ears! You know what to do!"

Grinning, Big-Ears found the sharp blade of a spear that had become detached from its haft. Grinning, he went to work. Trillo started to whimper, then to scream. Shrick felt a little sick.

"Stop!" he said. "He is not dead. You must—"

"What does it matter?" Wesel's eyes were avid, and her little, pink tongue came out to lick her thin lips. Big-Ears had hesitated in his work but, at her sign, continued.

"What does it matter?" she said again.

As had fared the Tribe of Tekka so fared the Tribe of Sterret, and a hand or more of smaller communities owing a loose allegiance to these two.

But it was in his war with Sterret that Shrick almost met disaster. To the cunning oldster had come survivors from the massacre of Tekka's army. Most of these had been slaughtered out of hand by the frontier guards, but one or two had succeeded in convincing their captors that they bore tidings of great importance.

Sterret heard them out.

He ordered that they be fed and treated as his own people, for he knew that he would need every ounce of fighting strength that he could muster.

Long and deeply he pondered upon their words, and then sent foray after foray of his young males to the Place-of-Life-That-is-Not-Life. Careless he was of detection by the Giants. They might or might not act against him—but he had long been convinced that, for all their size, they were comparatively stupid and harmless. Certainly, at this juncture, they were not such a menace as Shrick, already self-styled Lord of the Outside.

And so his store of sharp fragments of metal grew, whilst his armorers worked without cessation binding these to hafts of Barrier stuff. And he, too, could innovate. Some of the fragments were useless as spearheads, being blunt, rough, and irregular. But, bound like a spearhead to a shaft, they could deliver a crushing blow. Of this Sterret was sure after a few experi-

ments on old and unwanted members of his Tribe.

Most important, perhaps, his mind, rich in experience but not without a certain youthful zest, busied itself with problems of strategy. In the main tunnel from what had been Tekka's country his females hacked and tore at the spongy wall, the material being packed tightly and solidly into another small tunnel that was but rarely used.

At last his scouts brought the word that Shrick's forces were on the move. Careless in the crushing weight of his military power, Shrick disdained anything but a direct frontal attack. Perhaps he should have been warned by the fact that all orifices admitting light from the Inside had been closed. that the main tunnel along which he was advancing was in total darkness.

This, however, hampered him but little. The body of picked spearmen opposing him fought in the conventional way, and these, leaving their dead and wounded, were forced slowly but surely back. Each side relied upon smell, and hearing, and a certain perception possessed by most, if not all, of the People. At such close quarters these were ample.

Shrick himself was not in the van—that honor was reserved for Big-Ears, his fighting general. Had the decision rested with him alone he would have been in the forefront of the battle—but Wesel averred that the leader was of far greater importance than a mere spear bearer, should be shielded from needless risk. Not altogether unwillingly, Shrick acquiesced.

Surrounded by his guard, with Wesel at his side, the leader followed the noise of the fighting. He was rather surprised at the reports back to him concerning the apparent numbers of the enemy, but assumed that this was a mere delaying action and that Sterret would make his last stand in the Place-of-Meeting. It never occurred to him in his arrogance that others could innovate.

Abruptly, Wesel clutched his arm.

"Shrick! Danger—from the side!"

"From the side? But—"

There was a shrill cry, and a huge section of the tunnel wall fell inwards. The spongy stuff was in thin sheets, and drifted among the guard, hampering their every movement. Then, led by Sterret in person, the defenders came out. Like mountaineers they were roped together, for in this battle in the darkness their best hope lay in keeping in one, compact body. Separated, they would fall easy prey to the superior numbers of the hordes of Shrick.

With spear and mace they lay about them lustily. The first heartbeat of the engagement would have seen the end of Shrick, and it was only the uncured hide of Trilla, stiff and stinking, that saved his life. Even so, the blade of Sterret penetrated the crude armor, and, sorely

wounded, Shrick reeled out of the battle.

Ahead, Big-Ears was no longer having things all his own way. Reinforcements had poured along the tunnel and he dare not return to the succor of his chief. And Sterret's maces were having their effect. Stabbing and slashing the People could understand—but a crushing blow was, to them, something infinitely horrible.

It was Wesel who saved the day. With her she had brought the little, hot light. It had been her intention to try its effect on such few prisoners as might be taken in this campaign—she was too shrewd to experiment on any of the New People, even those who had incurred the displeasure of herself or her mate.

Scarce knowing what she did she pressed the stud.

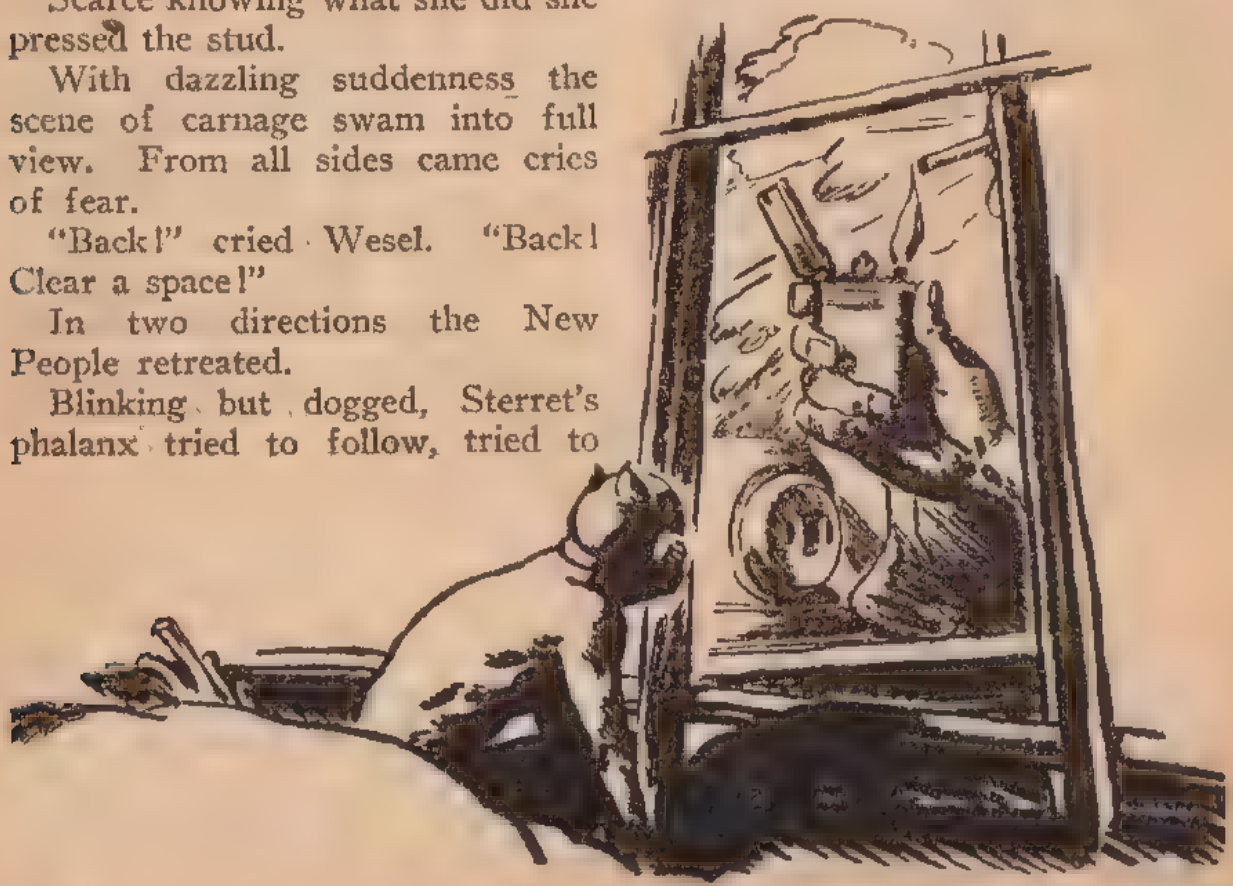
With dazzling suddenness the scene of carnage swam into full view. From all sides came cries of fear.

"Back!" cried Wesel. "Back! Clear a space!"

In two directions the New People retreated.

Blinking but dogged, Sterret's phalanx tried to follow, tried to turn what was a more or less orderly withdrawal into a rout. But the cords that had, at first, served them so well now proved their undoing. Some tried to pursue those making for the Place-of-Meeting, others those of the New People retiring to their own territory. Snarling viciously, blood streaming from a dozen minor wounds, Sterret at last cuffed and bullied his forces into a semblance of order. He attempted to lead a charge to where Wesel, the little, hot light still in her hand, was retreating among her personal, amazon guards.

But again the cunning—too cunning—ropes defeated his purpose. Not a few corpses were there to hamper fast movement, and almost none of his fighters had the intelligence to cut them free.



And the spear throwers of Shrick came to the fore, and, one by one, the people of Sterret were pinned by the slim deadly shafts to the tunnel walls. Not all were killed outright, a few unfortunates squirmed and whimpered, plucking at the spears with ineffectual hands.

Among these was Sterret.

Shrick came forward, spear in hand, to administer the *coup de grace*. The old chief stared wildly, then—"Weena's hairless one!" he cried.

Ironically it was his own spear—the weapon that, in turn, had belonged to Weena and to Tekka—that slit his throat.

Now that he was Lord of the Outside Shrick had time in which to think and to dream. More and more his mind harked back to Three-Eyes and her prophesy. It never occurred to him to doubt that he was to be the Giant Killer—although the vision of the End he dismissed from his mind as the vaporings of a half-crazed old female.

And so he sent his spies to the Inside to watch the Giants in their mysterious comings and goings, tried hard to find some pattern for their incomprehensible behavior. He himself often accompanied these spies—and it was with avid greed that he saw the vast wealth of beautiful, shining things to which the Giants were heir. More than anything he desired another little hot light, for his own had ceased to function, and all the clumsy, ignorant tinkerings of himself and Wesel could not produce more than a feeble, almost heatless spark from its baffling intricacies.

It seemed, too, that the Giants were now aware of the swarming, fecund life surrounding them. Certain it was that their snares increased in number and ingenuity. And the food-that-kills appeared in new and terrifying guise. Not only did those who had eaten of it die, but their mates and—indeed all who had come into contact with them.

It smacked of sorcery, but Shrick had learned to associate cause and effect. He made the afflicted ones carry those already dead into a small tunnel. One or two of them rebelled—but the spear throwers surrounded them, their slim, deadly weapons at the ready. And those who attempted to break through the cordon of guards were run through repeatedly before ever they laid their defiling hands on any of the unafflicted People.

Big-Ears was among the sufferers. He made no attempt to quarrel with his fate. Before he entered the yawning tunnel that was to be his tomb he turned and looked at his chief. Shrick made to call him to his side—even though he knew that his friend's life could not be saved, and that by associating with him he would almost certainly lose his own.

But Wesel was at his side.

She motioned to the spear throwers, and a full two hands of darts transfixed the ailing Big-Ears.

"It was kinder this way," she lied.

But, somehow, the last look that his most loyal supporter had given him reminded him of No-Tail. With a heavy heart he ordered his people to seal the tunnel. Great strips of the spongy stuff were brought and stuffed into the entrance. The cries of those inside grew fainter and ever fainter. Then there was silence. Shrick ordered guards posted at all points where, conceivably, the doomed prisoners might break out. He returned to his own cave. Wesel, when one without her gift would have intruded, let him go in his loneliness. Soon he would want her again.

It had long been Wesel's belief that, given the opportunity, she could get inside the minds of the Giants just as she could those of the People. And if she could—who knew what prizes might be hers? Shrick, still inaccessible and grieving for his friend, she missed more than she cared to admit. The last of the prisoners from the last campaign had been killed, ingeniously, many feedings ago. Though she had no way of measuring time it hung heavily on her hands.

And so, accompanied by two of her personal attendants, she roamed those corridors and tunnels running just inside the Barrier. Through spyhole after spyhole she peered, gazing in wonderment that long use could not stale at the rich and varied life of the Inside.

At last she found that for which she was searching—a Giant, alone and sleeping. Experience among the People had taught her that from a sleeping mind she could read the most secret thoughts.

For a heartbeat she hesitated. Then—"Four-Arms, Little-Head, wait here for me. Wait and watch."

Little-Head grunted an affirmative, but Four-Arms was dubious. "Lady Wesel," she said, "what it the Giant should wake? What—?

"What if you should return to the Lord of the Outside without me? Then he would, without doubt, have your hides. The one he is wearing now is old, and the fur is coming out. But do as I say."

There was a door in the Barrier here, a door but rarely used. This was opened, and Wesel slipped through. With the ease that all the People were acquiring with their more frequent ventures to the Inside she floated up to the sleeping Giant. Bonds held him in a sort of framework, and Wesel wondered if, for some offense, he had been made prisoner by his own kind. She would soon know.

And then a glittering object caught her eye. It was one of the little, hot lights, its polished metal case seeming to Wesel's covetous eyes the most beautiful thing in the world. Swiftly she made her decision. She could take the shining prize now, deliver it to her two attendants, and then return to carry out her original intentions.

In her eagerness she did not see that it was suspended in the middle of an interlacing of slender metal bars—or she did not care. And as her hands grabbed the bait something not far away began a shrill,

not unmusical metallic beating. The Giant stirred and awoke. What Wesel had taken for bonds fell away from his body. In blind panic she turned to flee back to her own world. But, somehow, more of the metal bars had fallen into place and she was a prisoner.

She started to scream.

Surprisingly, Four-Arms and Little-Head came to her aid. It would be nice to be able to place on record that they were actuated by devotion to their mistress—but Four-Arms knew that her life was forfeit. And she had seen those who displeased either Shrick or Wesel flayed alive. Little-Head blindly followed the other's leadership. Hers not to reason why—

Slashing with their spears they assailed the Giant. He laughed—or so Wesel interpreted the deep, rumbling sound that came from his throat. Four-Arms he seized first. With one hand he grasped her body, with the other her head. He twisted. And that was the end of Four-Arms.

Anybody else but Little-Head would have turned and fled. But her dim mind refused to register that which she had seen. Perhaps a full feeding or so after the event the horror of it all would have stunned her with its impact—perhaps not. Be that as it may, she continued her attack. Blindly, instintively, she went for the Giant's throat. Wesel sensed that he was badly frightened. But after a short struggle one of his hands caught the frenzied, squealing Little-Head. Violently, he flung her from him. She heard the thud as her attendant's body struck something hard and unyielding. And the impressions that her mind had been receiving from that of the other abruptly ceased.

Even in her panic fear she noticed that the Giant had not come out of the unequal combat entirely unscathed. One of his hands had been scratched, and was bleeding freely. And there were deep scratches on the hideous, repulsively naked face. The Giants, then, were vulnerable. There might have been some grain of truth after all in Three-Eye's insane babbling.

And then Wesel forgot her unavailing struggle against the bars of her cage. With sick horror she watched what the Giant was doing. He had taken the limp body of Four-Arms, had secured it to a flat surface. From somewhere he had produced an array of glittering instruments. One of these he took, and drew it down the body from throat to crotch. On either side of the keen blade the skin fell away, leaving the flesh exposed.

And the worst part of it was that it was not being done in hate or anger, neither was the unfortunate Four-Arms being divided up that she might be eaten. There was an impersonal quality about the whole business that sickened Wesel—for, by this time, she had gained a certain limited access to the mind of the other.

The Giant paused in his work. Another of his kind had come, and

for many heartbeats the two talked together. They examined the mutilated carcass of Four-Arms, the crushed body of Little-Head. Together, they peered into the cage where Wesel snarled impotently.

But, in spite of her hysterical fear, part of her mind was deadly cold, was receiving and storing impressions that threw the uninhibited, animal part of her into still greater panic. Whilst the Giants talked the impressions were clear—and whilst their great, ungainly heads hung over her cage, scant handsbreadths away, they were almost overpowering in their strength. She knew who she and the People were, what their world was. She had not the ability to put it into words—but she *knew*. And she saw the doom that the Giants were preparing for the People.

With a few parting words to his fellow the second Giant left. The first one resumed his work of dismembering Four-Arms. At last he was finished. What was left of the body was put into transparent containers.

The Giant picked up Little-Head. For many heartbeats he examined her, turning her over and over in his great hands. Wesel thought that he would bind the body to the flat surface, do with it as he had done with that of Four-Arms. But, at last he put the body to one side. Over his hands he pulled something that looked like a thick, additional skin. Suddenly, the metal bars at one end of the cage fell away, and one of those enormous hands came groping for Wesel.

After the death of Big-Ears, Shrick slept a little. It was the only way in which he could be rid of the sense of loss, of the feeling that he had betrayed his most loyal follower. His dreams were troubled, haunted by ghosts from his past. Big-Ears was in them, and Big-Tusk, and a stranger female with whom he felt a sense of oneness, whom he knew to be Weena, his mother.

And then all these phantasms were gone, leaving only the image of Wesel. It wasn't the Wesel he had always known, cool, self-assured, ambitious. This was a terrified Wesel—Wesel descending into a black abyss of pain and torture even worse than that which she had, so often, meted out to others. And she wanted him.

Shrick awoke, frightened by his dreams. But he knew that ghosts had never hurt anybody, could not hurt him, Lord of the Outside. He shook himself, whimpering a little, and then tried to compose himself for further sleep.

But the image of Wesel persisted. At last Shrick abandoned his attempts to seek oblivion and, rubbing his eyes, emerged from his cave.

In the dim, half-light of the Place-of-Meeting little knots of the People hung about, talking in low voices. Shrick called to the guards. There was a sullen silence. He called again. At last one answered.

"Where is Wesel?"

"I do not know . . . lord." The last word came out grudgingly.

Then one of the others volun-

teered the information that she had been seen, in company with Four-Arms and Little-Head, proceeding along the tunnels that led to that part of the Outside in the way of the Place-of-Green-Growing-Things.

Shrick hesitated.

He rarely ventured abroad without his personal guards, but then, Big-Ears was always one of them. And Big-Ears was gone.

He looked around him, decided that he could trust none of those at present in the Place-of-Meeting. The People had been shocked and horrified by his necessary actions in the case of those who had eaten of the food-that-kills and regarded him, he knew, as a monster even worse than the Giants. Their memories were short—but until they forgot he would have to walk with caution.

"Wesel is my mate. I will go alone," he said.

At his words he sensed a change of mood, was tempted to demand an escort. But the instinct that—as much as any mental superiority—maintained him in authority warned him against throwing away his advantage.

"I go alone," he said.

One Short-Tail, bolder than his fellows, spoke up.

"And if you do not return, Lord of the Outside? Who is to be—?"

"I shall return," said Shrick firmly, his voice displaying a confidence he did not feel.

In the more populous regions the distinctive scent of Wesel was overlaid by that of many others. In tunnels but rarely frequented it was strong and compelling—but now he had no need to use his olfactory powers. For the terrified little voice in his brain—from outside his brain—was saying *hurry, HURRY*—and some power beyond his ken was guiding him unerringly to where his mate was in such desperate need of him.

From the door in the Barrier through which Wesel had entered the Inside—it had been left open—streamed a shaft of light. And now Shrick's natural caution reasserted itself. The voice inside his brain was no less urgent, but the instinct of self-preservation was strong. Almost timorously, he peered through the doorway.

He smelled death. At first he feared that he was too late, then identified the personal odors of Four-Arms and Little-Head. That of Wesel was there too—intermingled with the acrid scent of terror and agony. But she was still alive.

Caution forgotten, he launched himself from the doorway with all the power of his leg muscles. And he found Wesel, stretched supine on a flat surface that was slippery with blood. Most of it was Four-Arms', but some of it was hers.

"Shrick!" she screamed. "The Giant!"

He looked away from his mate and saw hanging over him, pale and enormous, the face of the Giant. He screamed, but there was more of fury than terror in the sound. He saw, not far from where he

clung to Wesel, a huge blade of shining metal. He could see that its edge was keen. The handle had been fashioned for a hand far larger than his, nevertheless he was just able to grasp it. It seemed to be secured. Feet braced against Wesel's body for purchase, he tugged desperately.

Just as the Giant's hand, fingers outstretched to seize him, came down the blade pulled free. As Shrick's legs suddenly and involuntarily straightened he was propelled away from Wesel. The Giant grabbed at the flying form, and howled in agony as Shrick swept the blade around and lopped off a finger.

He heard Wesel's voice: "You are the Giant Killer!"

Now he was level with the Giant's head. He swerved, and with his feet caught a fold of the artificial skin covering the huge body. And he hung there, swinging his weapon with both hands, cutting and slashing. Great hands swung wildly and he was bruised and buffeted. But not once did they succeed in finding a grip. Then there was a great and horrid spurting of blood and a wild threshing of mighty limbs. This ceased, but it was only the voice of Wesel that called him from the fury of his slaughter lust.

So he found her again, still stretched out for sacrifice to the Giants' dark gods, still bound to that surface that was wet with her blood and that of her attendant. But she smiled up at him, and in her eyes was respect that bordered on awe.

"Are you hurt?" he demanded, a keen edge of anxiety to his voice.

"Only a little. But Four-Arms was cut in pieces . . . I should have been had you not come. And," her voice was a hymn of praise, "you killed the Giant!"

"It was foretold. Besides," for once he was honest, "it could not have been done without the Giant's weapon."

With its edge he was cutting Wesel's bonds. Slowly she floated away from the place of sacrifice. Then: "I can't move my legs!" Her voice was terror-stricken. "I can't move!"

Shrick guessed what was wrong. He knew a little of anatomy—his knowledge was that of the warrior who may be obliged to immobilize his enemy prior to his slaughter—and he could see that the Giant's keen blade had wrought this damage. Fury boiled up in him against these cruel, monstrous beings. And there was more than fury. There was the feeling, rare among his people, of overwhelming pity for his crippled mate.

"The blade . . . it is very sharp . . . I shall feel nothing."

But Shrick could not bring himself to do it.

Now they were floating up against the huge bulk of the dead Giant. With one hand he grasped Wesel's shoulder—the other still clutched his fine, new weapon—and kicked off against the gigantic carcass. Then he was pushing Wesel through the doorway in the Barrier, and sensed her relief as she found herself once more in familiar terri-

tory. He followed her, then carefully shut and barred the door.

For a few heartbeats Wesel busied herself smoothing her bedraggled fur. He couldn't help noticing that she dare not let her hands stray to the lower part of her body where were the wounds, small but deadly, that had robbed her of the power of her limbs. Dimly, he felt that something might be done for one so injured, but knew that it was beyond his powers. And fury—not helpless now—against the Giants returned again, threatening to choke him with its intensity.

"Shrick!" Wesel's voice was grave. "We must return at once to the People. We must warn the People. The Giants are making a sorcery to bring the End."

"The great, hot light?"

"No. But wait! First I must tell you of what I learned. Otherwise, you would not believe. I have learned what we are, what the world is. And it is strange and wonderful beyond all our beliefs.

"What is Outside?" She did not wait for his answer, read it in his mind before his lips could frame the words. "The world is but a bubble of emptiness in the midst of a vast piece of metal, greater than the mind can imagine. But it is not so! Outside the metal that lies outside the Outside there is nothing. *Nothing!* There is no air."

"But there must be air, at least."

"No, I tell you. There is *nothing*.

"And the world—how can I find words? Their name for the world is—*ship*, and it seems to mean something big going from one place to

another place. And all of us—Giants and People—are inside the ship. The Giants made the ship."

"Then it is not alive?"

"I cannot say. *They* seem to think that it is a female. It must have some kind of life that is not life. And it is going from one world to another world."

"And these other worlds?"

"I caught glimpses of them. They are dreadful, dreadful. *We* find the open spaces of the Inside frightening—but these other worlds are *all* open space except for one side."

"But what are we?" In spite of himself, Shrick at least half believed Wesel's fantastic story. Perhaps she possessed, to some slight degree, the power of projecting her own thoughts into the mind of another with whom she was intimate. "What are we?"

She was silent for the space of many heartbeats. Then: "*Their* name for us is—*mutants*. The picture was . . . not clear at all. It means that we—the People—have changed. And yet their picture of the People before the change was like the Different Ones before we slew them all.

"Long and long ago—many hands of feedings—the first People, our parents' parents' parents, came into the world. They came from that greater world—the world of dreadful, open spaces. They came with the food in the great Cave-of-Food—and that is being carried to another world.

"Now, in the horrid, empty space outside the Outside there is—light that is not light. And this light—changes persons. No, not the grown person or the child, but the child before the birth. Like the dead and gone chiefs of the People, the Giants fear change in themselves. So they have kept the light that is not light from the Inside.

"And this is how. Between the Barrier and the Far Outside they filled the space with the stuff in which we have made our caves and tunnels. The first People left the great Cave-of-Food, they tunneled through the Barrier and into the stuff Outside. It was their nature. And some of them mated in the Far Outside caves. Their children were—*Different.*"

"That is true," said Shrick slowly. "It has always been thought that children born in the Far Outside were never like their parents, and that those born close to the Barrier were—"

"Yes.

"Now, the Giants always knew that the People were here, but they did not fear them. They did not know our numbers, and they regarded us as beings much lower than themselves. They were content to keep us down with their traps and the food-that-kills. Somehow, they found that we had changed. Like the dead chiefs they feared us then—and like the dead chiefs they will try to kill us all before we conquer them."

"And the End?"

"Yes, the End." She was silent again, her big eyes looking past Shrick at something infinitely terrible. "Yes," she said again, "the End. *They* will make it, and *They*

will escape it. *They* will put on artificial skins that will cover *Their* whole bodies, even *Their* heads, and *They* will open huge doors in the . . . skin of the ship, and all the air will rush out into the terrible empty space outside the Outside. And all the People will die."

"I must go," said Shrick. "I must kill the Giants before this comes to pass."

"No! There was one hand of Giants—now that you have killed Fat-Belly there are four of them left. And they know, now, that they can be killed. They will be watching for you.

"Do you remember when we buried the People with the sickness? That is what we must do to all the People. And then when the Giants fill the world with air again from their store we can come out."

Shrick was silent awhile. He had to admit that she was right. One unsuspecting Giant had fallen to his blade—but four of them, aroused, angry and watchful, he could not handle. In any case there was no way of knowing when the Giants would let the air from the world. The People must be warned and fast.

Together, in the Place-of-Meeting, Shrick and Wesel faced the People. They had told their stories, only to be met with blank incredulity. True, there were some who, seeing the fine, shining blade that Shrick had brought from the Inside, were inclined to believe. But they were shouted down by the majority. It was when he tried to get them to immure themselves against the End that he met with serious opposition. The fact that he had so treated those suffering from the sickness still bulked big in the mob memory.

It was Short-Tail who precipitated the crisis.

"He wants the world to himself!" he shouted. "He has killed Big-Tusk and No-Tail, he has killed all the Different Ones, and Big-Ears he slew because he would have been chief. He and his ugly, barren mate want the world to themselves!"

Shrick tried to argue, but Big-Ears' following shouted him down. He squealed with rage and, raising his blade with both hands, rushed upon the rebel. Short-Tail scurried back out of reach. Shrick found himself alone in a suddenly cleared space. From somewhere a long way off he heard Wesel screaming his name. Dazedly, he shook his head, and then the red mist cleared from in front of his eyes.

All around him were the spear throwers, their slender weapons poised. He had trained them himself, had brought their specialized art of war into being. And now—

"Shrick!" Wesel was saying, "don't fight! They will kill you, and I shall be alone. I shall have the world to myself. Let them do as they will with us, and *we* shall live through the End."

At her words a tittering laugh rippled through the mob.

"*They* will live through the End! They will die as Big-Ears and his friends died!"

"I want your blade," said Short-Tail.

"Give it to him," cried Wesel. "You will get it back after the End!"

Shrick hesitated. The other made a sign. One of the throwing spears buried itself in the fleshy part of his arm. Had it not been for Wesel's voice, pleading, insistent, he would have charged his tormenters and met his end in less than a single heartbeat. Reluctantly, he released his hold upon the weapon. Slowly—as though loath to leave its true owner—it floated away from him. And then the People were all around him, almost suffocating him with the pressure of their bodies.

The cave into which Shrick and Wesel were forced was their own dwelling place. They were in pitiable state when the mob retreated to the entrance—Wesel's wounds had reopened and Shrick's arm was bleeding freely. Somebody had wrenched out the spear—but the head had broken off.

Outside, Short-Tail was laying about him with the keen blade he had taken from his chief. Under its strokes great masses of the spongy stuff of the Outside were coming free, and many willing hands were stuffing this tight into the cave entrance.

"We will let you out after the End!" called somebody. There was a hoot of derision. Then: "I wonder which will eat the other first?"

"Never mind," said Wesel softly. "We shall laugh last."

"Perhaps. But . . . the People. *My* People. And you are barren. The Giants have won—"

Wesel was silent. Then he heard her voice again. She was whimpering to herself in the darkness. Shrick could guess her thoughts. All their grandiose dreams of world dominion had come to this—a tiny, cramped space in which there was barely room for either of them to stir a finger.

And now they could no longer hear the voices of the People outside their prison. Shrick wondered if the Giants had already struck, then reassured himself with the memory of how the voices of those suffering from the sickness had grown fainter and fainter and then, at the finish, ceased altogether. And he wondered how he and Wesel would know when the End had come, and how they would know when it was safe to dig themselves out. It would be a long, slow task with only their teeth and claws with which to work.

But he had a tool.

The fingers of the hand of his uninjured arm went to the spear-head still buried in the other. He knew that by far the best way of extracting it would be one, quick pull—but he couldn't bring himself to do it. Slowly, painfully, he worked away at the sharp fragment of metal.

"Let me do it for you."

"No." His voice was rough. "Besides, there is no haste."

Slowly, patiently, he worried at the wound. He was groaning a little, although he was not conscious of doing so. And then, suddenly,

Wesel screamed. The sound was so unexpected, so dreadful in that confined space, that Shrick started violently. His hand jerked away from his upper arm, bringing with it the spearhead.

His first thought was that Wesel, telepath as she was, had chosen this way to help him. But he felt no gratitude, only a dull resentment.

"What did you do that for?" he demanded angrily.

She didn't answer his question. She was oblivious of his presence.

"The People . . ." she whispered. "the People . . . I can feel their thoughts . . . I can feel what they are feeling. And they are gasping for air . . . they are gasping and dying . . . and the cave of Long-Fur the spearmaker . . . but they are dying, and the blood is coming out of their mouths and noses and ears . . . I can't bear it . . . I can't—"

And then a terrifying thing happened. The sides of the cave pressed in upon them. Throughout the world, throughout the ship, the air cells in the spongy insulation were expanding as the air pressure dropped to zero. It was this alone that saved Shrick and Wesel, although they never knew it. The rough plug sealing their cave that, otherwise, would have blown out swelled to meet the expanding walls of the entrance, making a near perfect air-tight joint.

But the prisoners were in no state to appreciate this, even had they been in possession of the necessary knowledge. Panic seized them both. Claustrophobia was unknown among the People—but walls that closed upon them were outside their experience.

Perhaps Wesel was the more level-headed of the pair. It was she who tried to restrain her mate as he clawed and bit savagely, madly, at the distended, bulging walls. He no longer knew what lay outside the cave, had he known it would have made no difference. His one desire was to get out.

At first he made little headway, then he bethought himself of the little blade still grasped in his hand. With it he attacked the pulpy mass. The walls of the cells were stretched thin, almost to bursting, and under his onslaught they put up no more resistance than so many soap bubbles. A space was cleared, and Shrick was able to work with even greater vigor.

"Stop! Stop, I tell you! There is only the choking death outside the cave. And you will kill us both!"

But Shrick paid no heed, went on stabbing and hacking. It was only slowly, now, that he was able to enlarge upon the original impression he had made. As the swollen surfaces burst and withered beneath his blade, so they bulged and bellied in fresh places.

"Stop!" cried Wesel again.

With her arms, her useless legs trailing behind her, she pulled herself towards her mate. And she grappled with him, desperation lending her strength. So for many heartbeats they fought—silent, savage, forgetful of all that each owed to the other. And yet, perhaps,

Wesel never quite forgot. For all her blind, frantic will to survive her telepathic powers were at no time entirely in abeyance. In spite of herself she, as always, shared the other's mind. And this psychological factor gave her an advantage that offset the paralysis of the lower half of her body—and at the same time inhibited her from pressing that advantage home to its logical conclusion.

But it did not save her when her fingers, inadvertently, dug into the wound in Shrick's arm. His ear-splitting scream was compounded of pain and fury, and he drew upon reserves of strength that the other never even guessed that he possessed. And the hand gripping the blade came round with irresistible force.

For Wesel there was a heartbeat of pain, of sorrow for herself and Shrick, of blind anger against the Giants who, indirectly, had brought this thing to pass.

And then the beating of her heart was stilled forever.

With the death of Wesel Shrick's frenzy left him.

There, in the darkness, he ran his sensitive fingers over the lifeless form, hopelessly hoping for the faintest sign of life. He called her name, he shook her roughly. But at last the knowledge that she was dead crept into his brain—and stayed there. In his short life he had known many times this sense of loss, but never with such poignancy.

And worst of all was the knowledge that *he* had killed her.

He tried to shift the burden of blame. He told himself that she would have died, in any case, of the wounds received at the hands of the Giants. He tried to convince himself that, wounds or no wounds, the Giants were directly responsible for her death. And he knew that he was Wesel's murderer, just as he knew that all that remained for him in life was to bring the slayers of his people to a reckoning.

This made him cautious.

For many heartbeats he lay there in the thick darkness, not daring to renew his assault on the walls of his prison. He told himself that, somehow, he would know when the Giants let the air back into the world. How he would know he could not say, but the conviction persisted.

And when at last, with returning pressure, the insulation resumed its normal consistency, Shrick took this as a sign that it was safe for him to get out. He started to hack at the spongy material, then stopped. He went back to the body of Wesel. Just once he whispered her name, and ran his hands over the stiff, silent form in a last caress.

He did not return.

And when, at last, the dim light of the Place-of-Meeting broke through she was buried deep in the debris that he had thrown behind him as he worked.

The air tasted good after the many times breathed atmosphere of the cave. For a few heartbeats Shrick was dizzy with the abrupt

increase of pressure, for much of the air in his prison had escaped before the plug expanded to seal the entrance. It is probable that had it not been for the air liberated from the burst cells of the insulation he would long since have asphyxiated.

But this he was not to know—and if he had known it would not have worried him overmuch. He was alive, and Wesel and all the People were dead. When the mist cleared from in front of his eyes he could see them, their bodies twisted in the tortuous attitudes of their last agony, mute evidence of the awful powers of the Giants.

And now that he saw them he did not feel the overwhelming sorrow that he knew he should have done. He felt instead a kind of anger. By their refusal to heed his warning they had robbed him of his kingdom. None now could dispute his mastery of the Outside—but with no subjects, willing or unwilling, the vast territory under his sway was worthless.

With Wesel alive it would have been different.

What was it that she had said—?

. . . *and the cave of Long-Fur the spear maker* . . .

He could hear her voice as she said it . . . *and the cave of Long-Fur the spear maker.*

Perhaps— But there was only one way to make sure.

He found the cave, saw that its entrance had been walled up. He felt a wild upsurge of hope. Frantically, with tooth and claw, he tore at the insulation. The fine blade that he had won from the Inside gleamed dully not a dozen handsbreadths from where he was working, but such was his blind, unreasoning haste that he ignored the tool that would have made his task immeasurably shorter. At last the entrance was cleared. A feeble cry greeted the influx of air and light. For a while Shrick could not see who was within, and then could have screamed in his disappointment.

For here were no tough fighting males, no sturdy, fertile females, but two hands or so of weakly squirming infants. Their mothers must have realized, barely in time, that he and Wesel had been right, that there was only one way to ward off the choking death. Themselves they had not been able to save.

But they will grow up, Shrick told himself. *It won't be long before they are able to carry a spear for the Lord of the Outside, before the females are able to bear his children.*

Conquering his repugnance, he dragged them out. There was a hand of female infants, all living, and a hand of males. Three of these were dead. But here, he knew, was the nucleus of the army with which he would re-establish his rule over the world, Inside as well as Outside.

But first, they had to be fed.

He saw, now, his fine blade, and seizing it he began to cut up the three lifeless male children. The scent of their blood made him realize that he was hungry. But it was not until the children, now

quieted, were all munching happily that he cut a portion for himself.

When he had finished it he felt much better.

It was some time before Shrick resumed his visits to the Inside. He had the pitiful remnant of his people to nurse to maturity and, besides, there was no need to make raids upon the Giants' stocks of food. They themselves had provided him with sustenance beyond his powers of reckoning. He knew, too, that it would be unwise to let his enemies know that there had been any survivors from the cataclysm that they had launched. The fact that he had survived the choking death did not mean that it was the only weapon that the Giants had at their disposal.

But as time went on he felt an intense longing to watch once more the strange life beyond the Barrier. Now that he had killed a Giant he felt a strange sense of kinship with the monstrous beings. He thought of the Thin-One, Loud-Voice, Bare-Head and the Little Giant almost as old friends. At times he even caught himself regretting that he must kill them all. But he knew that in this lay the only hope for the survival of himself and his people.

And then, at last, he was satisfied that he could leave the children to fend for themselves. Even should he fail to return from the Inside they would manage. No-Toes, the eldest of the female children, had already proved to be a capable nurse.

And so he roamed once more the maze of caves and tunnels just outside the Barrier. Through his doorways and peepholes he spied upon the bright, fascinating life of the Inner World. From the Cave-of-Thunders—though how it had come by its name none of the People has ever known—to the Place-of-Little-Lights he ranged. Many feedings passed, but he was not obliged to return to his own food store. For the corpses of the People were everywhere. True, they were beginning to stink a little, but like all his race Shrick was never a fastidious eater.

And he watched the Giants going about the strange, ordered routine of their lives. Often he was tempted to show himself, to shout defiance. But this action had to remain in the realm of wish-fulfillment dreams—he knew full well that it would bring sure and speedy calamity.

And then, at last, came the opportunity for which he had been waiting. He had been in the Place-of-Little-Lights, watching the Little Giant going about his mysterious, absorbing business. He had wished that he could understand its purport, that he could ask the Little Giant in his own tongue what it was that he was doing. For, since the death of Wesel, there had been none with whom a communion of mind was possible. He sighed, so loudly that the Giant must have heard.

He started uneasily and looked up

from his work. Hastily Shrick withdrew into his tunnel. For many heartbeats he remained there, occasionally peeping out. But the other was still alert, must have known in some way that he was not alone. And so, eventually, Shrick had retired rather than risk incurring the potent wrath of the Giants once more.

His random retreat brought him to a doorway but rarely used. On the other side of it was a huge cavern in which there was nothing of real interest or value. In it, as a rule, at least one of the Giants would be sleeping, and others would be engaged in one of their incomprehensible pastimes.

This time there was no deep rumble of conversation, no movement whatsoever. Shrick's keen ears could distinguish the breathing of three different sleepers. The Thin-One was there, his respiration, like himself, had a meager quality. Loud-Voice was loud even in sleep. And Bare-Head, the chief of the Giants, breathed with a quiet authority.

And the Little Giant who, alone of all his people, was alert and awake was in the Place-of-Little-Lights.

Shrick knew that it was now or never. Any attempt to deal with the Giants singly must surely bring the great, hot light foretold by Three-Eyes. Now, with any luck at all, he could deal with the three sleepers and then lay in wait for the Little Giant. Unsuspecting, unprepared, he could be dealt with as easily as had Fat-Belly.

And yet—he did not want to do it.

It wasn't fear; it was that indefinable sense of kinship, the knowledge that, in spite of gross physical disparities, the Giants and the People were as one. For the history of Man, although Shrick was not to know this, is but the history of the fire-making, tool-using animal.

Then he forced himself to remember Wesel, and Big-Ears, and the mass slaughter of almost all his race. He remembered Three-Eyes' words—*but this I can tell you, the People are doomed. Nothing you or they can do will save them. But you will kill those who will kill us, and that is good.*

But you will kill those who will like us—

But if I kill all the Giants before they kill us, he thought, then the world, all the world, will belong to the People . . .

And still he hung back.

It was not until the Thin-One, who must have been in the throes of a bad dream, murmured and stirred in his sleep that Shrick came out of his doorway. The keen blade with which he had slain Fat-Belly was grasped in both his hands. He launched himself towards the uneasy sleeper. His weapon sliced down once only—how often had he rehearsed this in his imagination!—and for the Thin-One the dream was over.

The smell of fresh blood, as always, excited him. It took him all of his will power to restrain him-

self from hacking and slashing at the dead Giant. But he promised himself that this would come later. And he jumped from the body of the Thin-One to where Loud-Voice was snoring noisily.

The abrupt cessation of that all too familiar sound must have awakened Bare-Head. Shrick saw him shift and stir, saw his hands go out to loosen the bonds that held him to his sleeping place. And when the Giant Killer, his feet scrabbling for a hold, landed on his chest he was ready. And he was shouting in a great Voice, so that Shrick knew that it was only a matter of heartbeats before the Little Giant came to his assistance.

Fat-Belly had been taken off guard, the Thin-One and Loud-Voice had been killed in their sleep. But here was no easy victory for the Giant Killer.

For a time it looked as though the chief of the Giants would win. After a little he ceased his shouting and fought with grim, silent desperation. Once one of his great hands caught Shrick in a bone-crushing grip, and it seemed as though the battle was over. Shrick could feel the blood pounding in his head, his eyeballs almost popping out of their sockets. It took him every ounce of resolution he possessed to keep from dropping his blade and scratching frenziedly at the other's wrist with ineffectual hands.

Something gave—it was his ribs—and in the fleeting instant of relaxed pressure he was able to twist, to turn and slash at the monstrous,

hairy wrist. The warm blood spurted and the Giant cried aloud. Again and again Shrick plied his blade, until it became plain that the Giant would not be able to use that hand again.

He was single-handed now against an opponent as yet—insofar as his limbs were concerned—uncrippled. True, every movement of the upper part of his body brought spears of pain lancing through Shrick's chest. But he could move, and smite—and slay.

For Bare-Head weakened as the blood flowed from his wounds. No longer was he able to ward off the attacks on his face and neck. Yet he fought, as his race had always fought, to his dying breath. His enemy would have given no quarter—this much was obvious—but he could have sought refuge with the Little Giant in the Place-of-Little Lights.

Towards the end he started shouting again.

And as he died, the Little Giant came into the cave.

It was sheer, blind luck that saved the Giant Killer from speedy death at the intruder's hands. Had the Little Giant known of the pitifully small forces arrayed against him it would have gone hard with Shrick. But No-Toes, left with her charges, had grown bored with the Place-of-Meeting. She had heard Shrick talk of the wonders of the Inside; and now, she thought, was her chance to see them for herself.

Followed by her charges she wandered aimlessly along the tunnels just outside the Barrier. She did not know the location of the doors to the Inside, and the view through the occasional peepholes was very circumscribed.

Then she came upon the doorway which Shrick had left open when he made his attack on the sleeping Giants. Bright light streamed through the aperture—light brighter than any No-Toes had seen before in her short life. Like a beacon it lured her on.

She did not hesitate when she came to the opening. Unlike her parents, she had not been brought up to regard the Giants with superstitious awe. Shrick was the only adult she could remember having known—and he, although he had talked of the Giants, had boasted of having slain one in single combat. He had said, also, that he would, at some time or other, kill all the Giants.

In spite of her lack of age and experience, No-Toes was no fool. Woman-like, already she had evaluated Shrick. Much of his talk she discounted as idle bragging, but she had never seen any reason to disbelieve his stories of the deaths of Big-Tusk, Sterrett, Tekka, Fat-Belly—and all the myriads of the People who had perished with them.

So it was that—foolhardy in her ignorance—she sailed through the doorway. Behind her came the other children, squealing in their excitement. Even if the Little Giant had not at first seen them he could not have failed to hear the shrill tumult of their irruption.

There was only one interpretation

that he could put upon the evidence of his eyes. The plan to suffocate the People had failed. They had sallied out from their caves and tunnels to the massacre of his fellow Giants—and now fresh reinforcements were arriving to deal with him.

He turned and fled.

Shrick rallied his strength, made a flying leap from the monstrous carcass of Bare-Head. But in mid flight a hard, polished surface interposed itself between him and the fleeing Giant. Stunned, he hung against it for many heartbeats before he realized that it was a huge door which had shut in his face.

He knew that the Little Giant was not merely seeking refuge in flight—for where in the world could he hope to escape the wrath of the People? He had gone, perhaps, for arms of some kind. Or—and at the thought Shrick's blood congealed—he had gone to loose the final doom foretold by Three-Eyes. Now that his plans had begun to miscarry he remembered the prophecy in its entirety, was no longer able to ignore those parts that, in his arrogance, he had found displeasing.

And then No-Toes, her flight clumsy and inexpert in these—to her—strange, vast spaces was at his side.

"Are you hurt?" she gasped. "They are so big—and you fought them."

As she spoke, the world was filled with a deep humming sound. Shrick ignored the excited female. That noise could mean only one thing. The Little Giant was back in the Place-of-Little-Lights, was setting in motion vast, incomprehensible forces that would bring to pass the utter and irrevocable destruction of the People.

With his feet against the huge door he kicked off, sped rapidly down to the open doorway in the Barrier. He put out his hand to break the shock of his landing, screamed aloud as his impact sent a sickening wave of pain through his chest. He started to cough—and when he saw the bright blood that was welling from his mouth he was very frightened.

No-Toes was with him again. "You are hurt, you are bleeding. Can I—?"

"No!" He turned a snarling mask to her. "No! Leave me alone!"

"But where are you going?"

Shrick paused. Then: "I am going to save the world," he said slowly. He savored the effect of his words. They made him feel better, they made him bulk big in his own mind, bigger, perhaps, than the Giants. "I am going to save you all."

"But how—?"

This was too much for the Giant Killer. He screamed again, but this time with anger. With the back of his hand he struck the young female across the face.

"Stay here!" he ordered.

And then he was gone along the tunnel.

The gyroscopes were still singing their quiet song of power when Shrick reached the Control Room. Strapped in his chair, the navigator was busy over his plotting machine. Outside the ports the stars wheeled by in orderly succession.

And Shrick was frightened.

He had never quite believed Wesel's garbled version of the nature of the world until now. But he could see, at last, that the ship was moving. The fantastic wonder of it all held him spellbound until a thin edge of intolerable radiance crept into view from behind the rim of one of the ports. The navigator touched something and, suddenly, screens of dark blue glass mitigated the glare. But it was still bright, too bright, and the edge became a rapidly widening oval and then, at last, a disk.

The humming of the gyroscope stopped.

Before the silence had time to register a fresh sound assailed Shrick's ears. It was the roar of the main drive.

A terrifying force seized him and slammed him down upon the deck. He felt his bones crack under the acceleration. True child of free fall as he was, all this held for him the terror of the supernatural. For a while he lay there, weakly squirming, whimpering a little. The navigator looked down at him and laughed. It was this sound more than anything else that stung Shrick to his last, supreme effort. He didn't want to move. He just wanted to lie there on the deck, slowly coughing his life away. But

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the Little Giant's derision tapped unsuspected reserves of strength, both moral and physical.

The navigator went back to his calculations, handling his instruments for the last time with a kind of desperate elation. He knew that the ship would never arrive at her destination, neither would her cargo of seed grain. But she would not—and this outweighed all other considerations—drift forever among the stars carrying within her hull the seeds of the destruction of Man and all his works.

He knew that—had he not taken this way out—he must have slept at last, and then death at the hands of the mutants would inevitably have been his portion. And with the mutants in full charge anything might happen.

The road he had taken was the best.

Unnoticed, inch by inch Shrick edged his way along the deck. Now, he could stretch his free hand and touch the Giant's foot. In the other he still held his blade, to which he had clung as the one thing sure and certain in this suddenly crazy world.

Then he had a grip on the artificial skin covering the Giant's leg. He started to climb, although every movement was unadulterated agony. He did not see the other raise his hand to his mouth, swallow the little pellet that he held therein.

So it was that when, at long last, he reached the soft, smooth throat of the Giant, the Giant was dead.

It was a very fast poison.

For a while he clung there. He should have felt elation at the death of the last of his enemies but—instead—he felt cheated. There was so much that he wanted to know, so much that only the Giants could have told him. Besides—it was his blade that should have won the final victory. He knew that, somewhere, the Little Giant was still laughing at him.

Through the blue-screened ports blazed the sun. Even at this distance, even with the intervening filters, its power and heat were all too evident. And aft the motors still roared, and would roar until the last ounce of fuel had been fed into the hungry main drive.

Shrick clung to the dead man's neck, looked long and longingly at the glittering instruments, the shining switches and levers, whose purpose he would never understand, whose inertia would have defeated any attempt of his fast ebbing strength to move them. He looked at the flaming doom ahead, and knew that this was what had been foretold.

Had the metaphor existed in his language, he would have told himself that he and the few surviving People were caught like rats in a trap.

But even the Giants would not have used that phrase in its metaphorical sense.

For that is all that the People were—rats in a trap.

THE END.

by
MURRAY
LEINSTER

Interference

His job was simply investigation and cure of television interference sources. But the source this time was a little difficult to attack—

Illustrated by Williams

The racket came on the air about eight o'clock, and at eight-five the business office of American Broadcasting went up in the air like a gyrocket, making similar shrill screaming noises. The row came from somewhere in Brooklyn, and there wasn't a vision set in thirty miles—fifteen million customers—that could get anything but crazy [illegible]ks on its plate, or anything but a steady rasping noise on audio. It was just before the Melba Hour when Little Angy went on the air, and Little Angy was something the customers couldn't do without. So when this noise started on the vision channels at this special time, the business office began to shriek and wring its hands, and every locator-car on the prowl went streaking.

The racket wasn't too hard to

locate. Of course, like all short stuff, we had to chase it around corners. Mort and me, we went around one block three times before Mort realized that the whole block was one big warehouse and it had aluminum-foil insulation which was batting the stuff back and forth with a couple of fire-walls and vertical metal signs elsewhere. When we made a bigger circuit around it, we got back on the line and only had to track off three places where it was coming from two directions at once, and one where there were three steady beams of it from as many casual reflectors. But it didn't help any that the business office was having hysterics on the car set, telling us that Little Angy would be going on in twenty minutes, in fifteen minutes, that there were already two thousand complaints, the mayor had called up to find out what was the matter and the Pinky-Pank company had already filed a penalty-claim on the ground of loss of coverage, and if something wasn't done quick— And so on.

We found it, though. The stuff was coming out of a block of dingy-looking buildings, some of them occupied tenements and some boarded up. It was a pretty bum neighborhood. What always makes it worse is that when you get close enough to short stuff with power behind it, it's bouncing off every pot and kettle and gives you secondary dispersion-beams. So Mort and me, we piled out of our car and were just starting to work when the other cars came, and we divided up the street. We got started banging on doors with the old line of excuse-me-lady-but-there's-some-electrical-device-making-television-wave-length-interference-in-this-neighborhood-do-you-know-anybody-who-does electrical-experimenting-and so on. It ain't scientific, but it's usually pretty quick. Meanwhile we had our hand-receivers and we were using them frantic. *And* the business office was throwing fits.

Mort ran into a fighting drunk who answered his door and wanted to put up an argument, and I was yelling in a deaf woman's ear when my hand-receiver got the line; plain and clear, no out-of-phase stuff, all regular, polarized beam. I yelled to Mort. It was next door to the house where we were so we dusted down into the street. Next door was boarded up, and so was the house beyond, so we hauled off some planks and smashed a window and shinnied in, leaving one guy outside to explain to cops if any. Inside, we heard a soft sort of humming sound and we streaked it up the stairs—because Little Angy would be coming on in ten minutes or less, now—and I saw a sort of glow coming outa a door and I ran there, yelling:

"Hey, guy! Turn it off! Whatever it is, turn it off!"

And I went to the door to argue further, with Mort and three other guys from the other locator-cars behind me. And there it was.

Nope. No dead man. Not yet. The dead man came later. What we saw when we went in was a four-foot kinda ring of light hang-

ing about a foot under the ceiling. It was a pinkish-bluish light, reasonably bright—you could read by it easy enough—and humming softly to itself. But the thing was that it wasn't in a tube. It wasn't hanging on to anything. It was just there, absolutely still and absolutely solid. It looked like a ring of something that—well—it looked more like a ring of red-hot glass than anything else, if you get what I mean. Only there wasn't any heat and it was just bright regardless, there in midair. And it was still as if it had angle irons and braces holding it. It was fixed in place somehow! But you couldn't see how.

Mort stared at it, and the other guys too. Then Mort said:

"This is it, whatever it is. How do you turn it off?"

"Little Angy's coming on in five minutes," says another guy, to whom the business office was the law and the prophets. "We got to do something! We got to turn it off!"

"Sure!" I said. I'd been prowling around it, looking at it from every angle there was. "Show me a switch or a wire. This is a job for somebody who knows more than I do."

We all stared at it. It didn't move. It was solid! Then Mort said:

"No wires, no switch, no nothing. We gotta get some foil and beam it up. Let Tech figure it out. Any of you fellas wants to touch it, go ahead. I'm gonna beam it!"

He went out. A couple of the other fellas went with him. I heard 'em running downstairs. They were using flashlights. I heard the crash when they broke out the front door. We rate as emergency maintenance crews, you know, so it's not burglary or trespassing when we go barging around, any more than firemen or cops.

I fiddled with my hand-receiver. Yep, that was it. The stuff that was messing up all the television reception in the whole metrop was that ring of stuff hanging up there like a brick wall. There wasn't any wire to it, but it was radiating a flock of kilowatts. Mort came racing back with a big roll of paper-backed metal foil and some tape. The other fellas came with folding ladders. We got busy. It's funny, but nobody thought of touching it, or socking it with something, or trying to short it to a burn-out. It was too simple. Mort hung a sheet of foil to the ceiling, sticking it up with adhesive tape here and there. He strung it a yard from the ring. Another fella was setting up another one. They hung down like curtains, opposite each other. We stuck up two more, working fast. We had a kinda curtain around it, then. Then we swung the bottom edges of the metal-foil curtains toward each other so there was part of a sort of four-sided funnel around the thing. The short stuff it was giving off bounced off the foil and went straight up, and stuff like that goes straight through the heaviside layer. One fella went down to his car and came back.

"Business office says sets are workin' again," he reported. "Now we got to hunt for strays."

You don't often beam off interference, you know. Anything but a power line you usually turn off, firm, and let the legal department argue about it after. But if and when a power line has a leak that's making television-type interference, you beam it off like we'd done to this thing. It don't happen once in a coon's age, but we know how to do it. And we'd done it in time for Little Angy to go on the air and be received by an amusement-hungry populace.

O.K. We started looking for stray leakages of short stuff. We used more foil. Then Mort reported in, and all the check stations said O.K., and Mort came back and said:

"Buck and me have to sit by the fire till Tech gets here. Scram, you fellas."

The other fellas went out. There was some interference up in the Bronx. Four blocks hadn't any service at all, and the image was wabbling beyond that. So one car went there to find out who was using an ultraviolet machine with a bum condenser in it, and the others went on the prowl. Mort and me settled down for a rest. But when the others were gone, Mort looked at me with a kinda triumphant expression in his eyes.

"Buck," he says. "Whadda you think this thing is?"

"I've got three headaches already," I told him, "trying to figure it out."

"I got a hunch," he says again. "Did you ever hear of time travel?"

Sure! But it ain't possible. There was a guy proved that if you could travel in time you'd have to pass through all the time in between where you started from and where you went, and passing through meant being there, so you'd have to be spread out through all the time in between. And if you were spread out over a coupla hundred years it would be the same thing as being spread out over a coupla hundred miles. Not practical. Anyhow, not healthy. I said so.

"O.K.," says Mort, "but I've got a hunch you're seeing a time-travel device. Nobody on this earth at this time could make a thing like that. So it must be somebody at another time. Notice you can't look through the ring?"

I squinted up at it, and it was so. You could see the ceiling past the edge of the ring, and when we were hanging up the foil we saw the ceiling over the top of it. But I couldn't look through the ring of light.

"It's a doorway," says Mort. "Perhaps we'd better say a sort of elevator shaft to the future. It's a way so somebody maybe a hundred thousand years in the future can come back and look us over."

I felt funnier the longer I stayed around that ring of light. At first I'd been too busy trying to figure out how to handle the short stuff it was giving off, but now that we didn't have anything to do but wait for [illegible] they'd take their time—I be[illegible]

think that it was something very queer indeed.

"Yeah?" I said. "It's a way for somebody to come from another time, huh? Well then, where is he?"

The house we were in was all boarded up. We hadn't seen or heard anything at all, only noises we'd made ourselves.

"M-m-m," says Mort. "That's right. Let's look."

We'd come along a hallway to this room from the stairs. But there was another door inside here, and it was open. All the place was empty and old, with plaster falling down and everything dilapidated and dusty and musty-smelling. Mort took out his flashlight and went through that other door, swinging the beam around. He's hardly through when he lets out a squawk. Then there's silence, like he might've had to swallow to get so he could talk. Then:

"He's here," says Mort, strained. "He's right here. You might come see."

I felt cold chills run down my back. Mort says again:

"He's dead."

I went in and saw the dead man. He laid down on the floor, in the dust that was everywhere. He was a regular-looking guy, not any different from you or me, except his face had a funny expression on it. Some of the guys in Tech have that expression—the high-ups, mostly. College professors have it pretty often—not the higher-ups. Most chemists and a lot of preachers have it. It's the expression of a guy who doesn't worry about beating the other guy to something because he's busy with stuff more important to him than that. A sort of non-competitive look, you might say. The average guy on salary has not got it.

He laid there, stone dead, just where he'd dropped. There wasn't a mark on him. He seemed to be dressed just like you and me, the first instant you looked at him. But he wasn't. The cloth was different. His clothes weren't cut exactly right. And his shoes—Mort said:

"Look at those shoes, willya?"

They weren't leather, but something else. They were made to look sort of like our shoes, but they were one piece. They weren't put together. They were—well—molded, maybe. The same thing with his clothes. They weren't sewed together. They were just made. This stuff turned up later, you understand, and I found it out when Mort and me were being driven crazy by professors and such trying to drag more information out of us than we had. But right at the beginning I saw that this guy woulda looked perfectly all right if you just glanced at him casual, but if you looked close you'd see the difference. But he was a pleasant-faced fella, at that.

"What—" I swallowed. "What killed 'im?"

"I dunno," says Mort. "I guess the cops will be askin' us that presently. So I'm goin' to take a look, first."

He fished in the fella's pockets. They weren't right. Mort's arm went in almost up to the elbow. He came out with a handful of stuff. He handed half of it to me and stared at the rest. That was when I first saw the picture of the girl. I almost dropped when I first looked at it, because it didn't look like a flat picture. It looked like I was looking in through a window at some scenery that went on forever. Three-dimensional stuff, you know. But was it three-dimensional? There was light behind the girl, and it was sure-enough light behind her. And that girl looked sweet. Like a darned sweet kid. A little bit wistful, but confident and brave and smiling and looking at somebody she liked a lot. Maybe—I figured this out later, too—the guy who'd had the picture had taken it, and she smiled at him while he was doing it. I'd like to have a girl like that smile at me like that.

I was staring at the picture when Mort swore:

"What," he says, "is this stuff for?"

There was a thing like three or four rings interlocked, only they couldn't move but so far in any direction. What it was for is your guess, I don't know. There was a little card with a sort of stubby pencil. Later on we found out there are all sorts of coils and condensers and things inside the thickness of the card, all packed in so it's no thicker than it needs to be for you to hold it. Somebody has figured since that it's a sort of recording telegraph, so you can send a written message to somebody at a distance, but nobody can make it work, yet. And there was a thing that looked like a cigarette lighter, with a thumb stud. Mort pushed it and a streak of blue light came out and there was a small round hole up to the sky. Then his hand jumped, and the round hole changed to a wavery empty space like a saw-cut through the ceiling and roof and everything.

Mort dropped it, and his face went white.

"Le's get out of here!" says Mort.

We went back in the room with the light. Mort was white as a sheet, but suddenly he says:

"That proves it! It's a time-travelin' device. We couldn't make things like this. This guy came from some place a million years from now!"

I shoved the picture in my pocket and showed him the rest of what I had. There was a little ball of white metal. Period. There was a flat white square of something that looked like plastic. Period. There was a bit of machinery that was working. You could see wheels like clockworks running inside of a glasslike case. It didn't make sense.

"This guy musta been crazy," I said, trying to pretend I wasn't dizzy inside. "What does a grown man want to carry marbles and ring-puzzles and funny-shaped blocks of plastic for? And what does he carry machinery like this, for?"

"We carry watches," says Mort. He added, his eyes gleaming. "Look! This guy came back to our

time from a million years A.D.!"

"He ain't bald and he's got teeth," I said, objecting. "He looks just like you and me."

"Maybe not a million," says Mort, feverish. "Maybe fifty thousand. Maybe only twenty-five thousand. But our civilization's only a coúpla thousand years old. The electric part's not two hundred, yet! Suppose a guy like you went back a hundred thousand years and a cave man went through your pockets. You've got a pocketknife. He'd never get it open. You've got a watch. He'd never guess there was such a thing as hours and minutes. Your fountain pen—what'd he know of writing? Your little black book wouldn't mean a thing to him. Your handkerchief— He'd never guess what it was for. What have you got that he'd understand? Gum? Matches? Tobacco? Money? See what I mean?"

I said:

"There's a dead man in there, and we'd better call the cops and tell 'em."

"Not yet!" says Mort. His eyes glittered and blinked. He trembled all over. "Look here, Buck! This guy came from the future. There's no doubt about it! The door he

came through is still right there! If that door's still open, guys from the technical department will get to talking through it when they come. They'll all get credit and all the benefit outa it. But if we can get some information ahead of those guys we can clean up! Think what they must have in the future that we ain't got! Their television sets oughta be honeys. Their—"

He shook all over. Mort is a pretty smart guy in some ways, but he didn't see the real point he'd just made. To tell the truth, neither did I. I've got a developing set and a printer, though, and I take a lot of pictures. So I could see—I'd already seen—that if I could dope out how that three-dimensional stuff was done I'd really have something. So I was willing to go along with Mort for a while.

"What're you going to do?" I asked.

Mort already had his wallet out. He had his driver's license out from behind its celluloid window. His hand trembled.

"I'm goin' to do a card trick," says Mort. But his voice shook.

He took his driver's license and skimmed it up at the center of the ring of light. It went right through. It shoulda hit the ceiling and dropped back. It didn't. If it had fallen anywhere but back through the ring, it woulda hit the foil and come back to the floor anyway. But it just vanished.

"They've got it," says Mort, shivering. "They've got my picture and my driver's license. That's to tell 'em somebody else besides the guy in the next room is trying to talk to 'em. Maybe English has changed so much they can't read our kind a hundred thousand years from now. Anyhow—"

He tossed up a quarter. Hard. If it had hit the ceiling, we'd have heard it. The light ring didn't hum too loud for that. But the quarter went through the middle of the ring that we couldn't see through, and it didn't hit anything, and it didn't drop back.

"Gimme something to throw through!" say Mort. "So they'll understand what I'm trying to do!"

He took an envelope out of his pocket and scribbled on it: *"Hello! Hello! Hello! Men of the future, hello!"* He skimmed it up. It didn't come back either.

Then he sat there, biting his nails, staring up. So did I. And then something came down out of the middle of the ring of light. It was a metal rod with a round glass ball on the end of it. It came down, stayed for maybe a second, and went up again.

"There wasn't any hole in the ceiling!" says Mort, his teeth chattering. "What was that? What would we do if we were on the other side of a ring like that—"

I said maybe the only intelligent thing I thought of during the whole business.

"If we were working on it from that end," I said, "and we wanted to know what happened to a guy we were scared to follow, we'd shove a camera through to snap his picture."

"Right!" says Mort, staring at

me. "Now they'll see us an' know we're trying to talk to 'em—"

We waited. The rod came down again. It had a clamp on the end of it now. There was a picture in the clamp. It was a picture of the guy who was dead in the next room.

"They want to know where he is!" said Mort.

He took the picture out of the clamp. He was so excited that he didn't notice what I saw right away. That picture was three-dimensional color, too. It stood out just like the picture of the girl I had in my pocket. But Mort took it, and on the blank back side of it he scribbled a sketch of a man lying down on the floor—it was a bum picture—with two other men standing by him. And he drew the two other men, who were supposed to be us, looking very sad and grief-stricken.

He put it back in the clamp and shoved it up. It went on up through the ring. There was a long pause. Mort got restless.

"I'm not a good artist," he said shakily. "Maybe they think we killed him. Say! I'm going to send up my hand-receiver."

He picked it up and tossed it through the ring of light. It stayed gone, though I couldn't help wincing and waiting to hear it crash. But it didn't. It stayed put.

Then the clamp came down once more. It had another picture in it. At least, it had a sheet of paper that seemed to be all black on one side. But when Mort grabbed it and looked at it, it seemed to be all dancing spots of light. He tore his hair.

"I don't get it!" he says, feverish. "I send 'em my picture and they send a camera down. Then they send a picture of the dead guy in the next room. I send 'em up a handset, that'll at least show 'em we can handle short waves, and they send me a picture with a lot of sparkles on it."

I stared at the picture. The sparkles were different sizes and tints. Suddenly I saw it.

"This's a star map!" I said. "Look! It's a picture of the sky! There's the Big Dipper! See? And there's the Little Dipper and the Pole Star! But what's it for?"

Mort fairly yelled with relief.

"I got it!" he panted. "They figured out! If we send 'em a picture of the stars, they can figure out if they hit the time they were aiming for! They're askin' us what year this is!"

He ran out of the room and downstairs. I knew what he was after. He used to read those popular science magazines, and they always have a star map in them, telling amateur astronomers where to find planets and comets and such. He had one of them in the locator-car. He'd gone after it.

I waited. The clamp hung down. There was a dead man in the next room. Presently I figured maybe they'd get tired of waiting, so I tore a leaf out of my little black book and drew the clamp, and then another picture. It was a stick-man running downstairs. Then I drew

something out of a car, and then running upstairs again. I put it in the clamp and gave it a shove and it was pulled up and vanished. And they understood all right. The clamp came down again, empty, and it waited.

I was looking at the picture of the girl when I heard Mort on his way upstairs again.

"I got it!" he panted. "Here's this magazine and I've opened to the star map for this month. They'll realize we got sense and we'll learn plenty!"

He tied a string about the magazine where it was already opened, and put it in the clamp. He shoved it, and it went up. Mort stood there, staring feverishly, figuring what he was going to ask next. The star map stayed up there. The clamp didn't come down. Nothing happened.

Then the ring of light went out And it stayed out.

Mort tore out most of his hair when the thing stayed that way. He might have gone off his nut if a smart scientist from a research foundation hadn't talked confidentially to both of us a few days later.

"Nobody in the world coulda done better," said that guy comfortingly. "They were trying time travel, and the math is tricky. They wanted to find out if they'd gone into the future or the past. You told them with that star map—neither—and they went away. There's nothing here they wanted. We're like cave men, to them. Nothing we could say would interest 'em. You did all right."

Mort said:

"But—listen! Where did they come from? And that dead guy—"

"What does it matter where they came from?" asked the guy from the foundation. "A parallel time track most likely, where they got started up the ladder say fifty thousand years before us. But the important thing is what we get out of it. And we get plenty. Those gadgets. That dead man—we know he got killed because he didn't wear an insulated suit when he came through that ring. Since he didn't, he lived only five minutes. But when *we* go barging around in time we'll know how to do it."

I'd been listening, and I butted in:

"Yeah," I said, "you think we're going to do that sort of thing too? You guess we'll go—well—to where those guys came from?"

"Why not?" says the guy from the foundation. "In a thousand years?"

It was ten days after the whole business began. I'd had a lot of time to think.

"Listen," I said, "when you get set and you want somebody to wear an insulated suit, you let me know, huh?"

I grinned, but I've still got that picture the dead guy had on him. It's a picture of a swell kid. A darned sweet kid. And somehow I don't feel like grinning when I think of it. I wouldn't mind trying to find that kid to give her back her picture and tell her I'm sorry about the guy.

THE END.

THE ANALYTICAL LABORATORY

THE June Astounding carried six stories, and was apparently rather evenly matched—the point scores indicate the distribution of votes was fairly even.

Brass Tacks, incidentally, evidently rates quite a few votes as a feature. It's an unusual feature; I have practically no control over it. I can run it, or not run it, but beyond that I can do nothing about it—you'll have to do that for yourselves. However, I do not see any point in a simple listing of vote letters; the vote-letters are important, so if you have no time for more than a listing of your preferences in order on a post card, please send it in. But that doesn't make a Brass Tacks.

Wherefore, be it known unto the readers of Astounding, that Brass Tacks appears when, and only when, there's a reasonably good stack of interesting letters. Science-fictioneers should have sufficiently wide-roaming imaginations, interests, and ideas to write some good commentaries. If a reasonable number of you will write such letters, we'll have Brass Tacks more regularly. But I can't have Brass Tacks with one or two letters of interesting comment, and a stack of vote cards.

Incidentally, we science-fictionists have been talking about what is now generally known as the "post-war world" for some fifteen-odd years. Street & Smith has published Astounding every month now for a full twelve years. Does seem as though some of the old hands at this game should have some fairly well thought-out ideas on how a post-war world could be set up to operate; after all, we've been thinking about, and discussing, the cultural effects of the devices that have now been brought into production about a decade longer than the rest of the world.

Somewhere among this readership, there ought to be some fairly sound, well-considered thoughts. I'd like to see them—and print them. Since I would like to print them, in discussing the factors you believe will be of importance, discuss the ones that have been publicly announced, not possible future devices. For instance: on the Editorial page we have a science-fiction-eyewitness account of a V-2 take-off. What sort of a threat to a world order does a perfected, twelve-thousand-mile range V-2 pose? Does the United Nations mechanism set up at San Francisco adequately cover it?

Barred from discussion on this level are such things as disintegration rays, tractor beams, force shields and other science-fiction destructive agencies—even if you happen to know a guy down the street who says he's got one that works. If he's right, it's a military secret; if he's wrong, it doesn't belong.

But that Brass Tacks you seem to want depends on you, not on me. That's one place where neither my handiwork nor the handiwork of the authors normally belongs.

To get back to the ratings:

Place	Story	Author	Points
1.	Three Blind Mice	Lewis Padgett	2.36
2.	Pandora's Millions	George O. Smith	2.57
3.	Golden Journey	A. Bertram Chandler	3.36
4.	The Ethical Equations	Murray Leinster	3.70
5.	Heir Apparent	A. E. van Vogt	3.92

THE EDITOR.

Concluding van Vogt's tale of a world of logic and battle with illogic. For the first time in the story, the true scope of the action is revealed. Two days after you finish the story, you'll realize its size more fully.

World of Ā

by A. E. VAN VOGT

Illustrated by Orban

Synopsis

By the year 2500 A.D., the semantic philosophy of Ā dominated human existence. Annually, in the games of the Machine, hundreds of thousands of young men and women competed during the policeless month, and tried to become [illegible] lesser winners were awarded all the good jobs on Earth. The top winners, many thousands each year, were sent to glorious Venus, there

to become citizens in an all Ā civilization.

Gilbert Gosseyn received his first shock on the eve of the first day of the games. He was barred from the mutual protective group of the hotel in which he was staying, because a lie detector stated that he was not Gilbert Gosseyn. The hotel management promptly expelled him from his room.

Out in the night, a young woman, who turns out to be Patricia Hardie, daughter of the president of Earth, lures him into a trap. This results in his discovery that her father and a mysterious cripple called "X", together with a sardonic giant named Thorson, are plotting the destruction of Ā. They are using an instrument called the Distorter to get their men through the games of the Machine, and so into key positions.

The three plotters become very excited when they discover that Gosseyn has an extra-human section in his brain. He is killed in a sensational effort to escape.

Gosseyn returns to consciousness in the hospital of John and Amelia Prescott on Venus. He has full memory of having been killed, and he realizes that somehow, someway, his personality has been preserved in another duplicate body. It is the only possible explanation.

He swiftly discovers that he is illegally on Venus, and accordingly is automatically subject to death. He escapes into the Venusian wilderness, pursued by Venusian detectives.

Venus turns out to be a fantastic land with trees three thousand feet tall and hundreds of feet in diameter. It abounds with natural fruits and vegetables, and the climate is perpetually, marvelously mild. It is a land of dreams, the heaven of the Solar System.

On the sixteenth day, a roboplane agent of the Games Machine temporarily rescues him. It warns him, however, that he cannot escape capture, and persuades him to go to the forest home of a Venusian detective named Crang. It tells him that fully half the detectives on Venus are agents of the gang, and, at the last minute, as he is getting out of the plane, it explains that there is an unknown alien factor in the affair. But that whatever evidence is available, he will find it in Crang's tree home.

Nobody is home when Gosseyn first arrives at the tree home. He spends a couple of nights there waiting for Crang to return. Strange dreams afflict his sleep, dreams about beings and ships that have come from remote interstellar space. He has previously noticed a tunnel at the back of the apartment, a tunnel into the depth of the tree.

He decides to explore the tunnel, but it turns out to be very long, intertwining through the roots of the colossal trees, so he returns to the tree house for food. He is captured and taken to Earth.

There he sees the body of Gosseyn I, and realizes that he IS in a second duplicate body. He is invited to join the gang, and has just refused when John Prescott, the

Venusian kills President Hardie and "X", and drugs the other men in the room. Gosseyn and Prescott escape, and Gosseyn seeks out a psychologist to find out what it is in his brain that has made him the center of intrigue, and actually held up the gang's plan to invade Venus.

The psychologist, Dr. Kair, examines his extra-brain, and for the first time he learns the difficulties in the way of training that part of his mind. In the midst of the investigation, they discover that Prescott is really an agent of the inner group of the gang, and that he killed Hardie and "X" with double purpose of convincing Gosseyn of his bona fides, and of using the hunt for the assassins as a means of whipping up the population of Earth against the Machine and Venus.

Kair and Gosseyn escape in a plane, after learning from Prescott that the Distorter is in the wall of Patricia Hardie's bedroom. Kair plans to take Gosseyn to a lakeshore cabin which he owns, but after the psychologist falls asleep, Gosseyn realizes there is no time to waste. He carefully turns the plane around, and jumps in an antigravity parachute down onto the palace balcony that leads into Patricia Hardie's apartment.

He is captured by Crang—and turned loose. After what Prescott overheard Kair discover about Gosseyn's brain, the gang no longer fear him. Indeed, they are convinced that they are expected to kill Gosseyn. They refuse.

Free, Gosseyn doesn't know what to do with himself. He goes to the Games Machine. And it tells him that Crang was right: He has served his purpose. He was used, first to startle the gang leaders, then to show them that their secret hiding place on Venus was known. It was all part of an immense political maneuvering, and it is up to him now to make way for Gosseyn III, whose extra-brain is already trained.

The Machine also tells him that Venus has been invaded and all its cities captured, and that therefore he must waste no time in killing himself. Gosseyn refuses to do so, but later after boldly entering the palace, and sending the Distorter to the Machine, he realizes that he has no alternative.

He rents a room in a hotel, drugs himself with Coue hypnotic drug, sets a gramophone record to repeating endlessly that he must kill himself; and he is lying there half unconscious when he hears heavy gunfire. He drags himself out of bed, turns on the radio, and hears the Games Machine tell him not to kill himself because the body of Gosseyn III has been accidentally destroyed, and so it is up to him to escape and train his extra-brain.

Vaguely, Gosseyn hears the announcer say finally that the Machine has been destroyed. He returns to the bed, and slowly forgets what he has been told by the Machine. There is only the whining voice of the record repeating: "Kill yourself, kill yourself—"

Part III

XVI.

"To the biochemist, biophysicist, biologist, and physiological psychologist, however, life and mind are so amazingly complex and comprise so many heterogeneous processes that their blanket designation as two emergent levels cannot seem very illuminating . . . to the observer who contemplates the profuse and unabated emergence of idiots, morons, lunatics, criminals and parasites."

W.M.W

Gosseyn's first conscious effort was to move his hands. He couldn't. He seemed to be lying on top of them.

"Funny position," he thought.

A vague annoyance swept him, and an awareness that he'd have to emerge further out of his hypnotic sleep, to free himself.

He was about to struggle into awakedness, when a memory came as to why he had come to this hotel room. All through his body, his muscles began to grow tense. Eyes closed, he waited for the will-to-death to surge through him. The best method, it seemed to his taut mind, was to snatch the automatic he had put on the table beside the bed. And fire into his brain, in one synchronized movement.

That brought him back to the problem of his imprisoned hands. He decided meticulously that the act of reaching for the gun would serve to release at least one of his arms.

The idea pleased some instinct in him for economy of muscular activity. He waited.

But the dark impulse of suicide did not come. Instead, out of the depths of him welled a cheerful confidence, a buoyant sense of certain victory, a conviction that nothing could stop him.

Realization penetrated that the whining voice of the record had stopped. Stopped? But he had set it to play endlessly.

For the first time, he tried to open his eyes. And couldn't.

"It's that Coue hypnotic drug," he thought in agony. "Like dope."

But the fact that the drug still had such a hold upon him only made queerer his high spirits. He must have listened for hours to mind-destroying words. He ought to be in a bad way mentally.

There had been an interruption, he remembered uneasily. Loud sounds. The connection was obscure, but he had seemed to get out of bed. Had he shut off the record player at that time?

Such an interruption would have prevented his getting the full effect of the word barrage. It would probably by itself have stopped him from killing himself. But that didn't explain this . . . this *health* feeling.

"I'm sure," said a woman's voice persuasively from his left, "that you can manage now. The drug is not all-powerful."

The unexpected words did it. Gosseyn opened his eyes, and tried to free his arms. Two awarenesses

flashed upon him almost simultaneously:

He *was* lying on his arms, but that wasn't the reason he couldn't use them. They were handcuffed together.

And sitting in a chair beside the bed, smoking a cigarette, looking at him from under mascaraed eyelids, was Patricia Hardie.

Slowly, Gosseyn, who had half sat up, sank back onto his pillow. The girl took a long puff at her cigarette. Not until she had blown a lazy streamer of smoke at the ceiling did she speak. She said:

"I chained you up because you're a rather dominating person with a very strong will to know things."

She laughed. It was a quiet, relaxed, wonderfully musical laugh. It startled Gosseyn.

He noticed, suddenly, that she looked—different. The pettish expression, that attribute of neuroticism, was gone from her. All the pleasing features of her good-looking face remained, but they were changed in a subtle fashion.

Her beauty, that had been weak though bright, was revealed now in strength. Vivid as fire, her personality *streamed* at him.

She had always been cool, sure of herself. Enhanced by her new maturity, those qualities showed magnificent. In some indefinable fashion, the pretty, headstrong girl had overnight become a glowingly alive beautiful woman, who said:

"I had better get down to business. I took the risk of coming here, because your action in sending the Distorter to the Games Machine has backfired. And [illegible] will have to be done about it tonight."

She leaned forward tensely to go on. But even as she parted her lips, she seemed to realize that he wasn't ready. She drew back. And waited.

For Gosseyn, it was a welcome pause. His mind was still wrapped around what she had said earlier: "You have . . . a will to know about things." He had indeed, but where did she fit into that?

He was not, he realized, grasping the meaning of her presence here, Patricia Hardie, who had sworn on a lie detector that she knew just so much and no more—acting now as if she knew more.

He remembered his false memory about her, when he had first come to the city of the Machine: his belief that he had been married to Patricia Hardie, but that she was dead and he a widower. And then there was the debt he owed her for having tried to help the first Gilbert Gosseyn escape.

Her various attempts to help him had been at least partly explained by her story the night she tried to kill him. But that was the trouble, that lie detector-verified story!

She studied him for a moment after he had asked the question. Then she sighed. She said:

"I see I'm going to be here a lot longer than is safe for me. Very well, you may regard it as fact that lie detectors can be nullified. It would take too long to explain the details."

"Then if you're not what you

said, who are you?"

She drew a deep breath. "I'm not going to tell you. There isn't time."

"Oh, there isn't!" Gosseyn gazed at her in exasperation. He had heard too many phrases like that to be interested in the reasons for them. He realized he was finally coming fully awake, as he went on curtly: "I'm afraid we'll just have to make time.

"Let me see," he continued, "last time you said you had been ordered to play the role of President Hardie's daughter, but that you were afflicted with the same amnesia as I so far as anything else was concerned. Let's begin there. Who told you that you had to be the president's daughter?"

The young woman sat for a moment with eyes closed. Without opening them, she began to speak:

"I'm going to be very patient with you," she said. "I'm going to tell you that the Distorter is still in the Games Machine, where you sent it. And that we must have it. It is one of the few alien devices within our reach. We need it for evidence."

"My opinion," said Gosseyn, "of a group that has permitted two planets to be taken over without once issuing a general warning, is so low that it can hardly be put into words."

He stopped there. "Evidence!" he said.

She seemed not to hear the final word. "You musn't be too harsh," she said in a low voice. "It was intended to issue warnings, but their use of a forbidden instrument, the Distorter, prevented."

"Forbidden!" Gosseyn echoed blankly. "Forbidden by whom?"

She looked at him, and then slowly shook her head. She said quietly:

"None of that matters now. Later, when you have rescued the Distorter, I'll tell you much more. But now, listen:

"There is a young man here in the hotel, who will help you. He is no agent of mine, but you will find out all about him when you read his note, after I leave.

"He, not I, was the one who saved you from the hypno. Mind you, I got here in time to have saved you from the worst effect. But he did something that I couldn't have done. Because of him, no one knows that you are in this hotel.

"And Gilbert!" She leaned forward. She seemed unaware that she had used his first name. Her eyes were a soft blue. "Don't be too impatient. I admit you're being used roughly. But that's because you're out in the open. We don't dare let you have information that they might obtain from you."

She broke off: "Think of it this way: You were brought out when the crisis was near. They were startled, but they killed you, and waited for the next move. You reappeared in a second body. They immediately got hold of you, but we introduced a slight variation in their plan for you, by having you turn up at *the* key point, so far as

they were concerned, in the entire Solar System.

"Gilbert, you can't imagine what a shock that was to them. They grew immensely cautious. Discovering the untrained nature of your extra-brain, they decided to release you.

"That was a political move. I won't explain that, because it would take too long. But at the present time, their attitude towards you is that you are no immediate danger to them. Particularly now that your third body has been destroyed, they're discounting you. They'll kill you on sight, of course, merely as a—"

Gosseyn said: "Now that my third body has been what?"

For the first time since he had wakened, she looked startled.

"You mean, you don't *know?*" she breathed. "You have no idea what's been happening." Her tone changed. "No wonder you've been so obstinate. And I was just beginning to think I was married to a dumbbell."

She stood up, biting her lip. "Now, *there* was a slip. I'd better get out of here before I tell you everything. But remember, take the Distorter to the home of the young man downstairs. I'll meet you there some time tomorrow."

She was fumbling in her purse. She drew out a key, which she tossed onto the bed.

"For the handcuffs," she explained. "Good-by, darling, and good luck."

She went out of the door.

Gosseyn removed the handcuffs from his wrists, and then he sat firmly down on the edge of the bed, and thought: "What was she talking about?"

Marriage? He felt blank. It had occasionally struck him that Patricia Hardie was the only good-looking girl he knew, and that he couldn't go on forever being a bachelor. But that there had been any truth in that curious belief of his that he was her widower—it seemed meaningless.

He'd have to think it over. As for the rest, the Distorter and some young man—what was it she had said? A note that explained.

His puzzled gaze, roving the room, touched the bureau to the right of the bed, behind him. A newspaper lay there, and a sheet of white paper. *Note!* Gosseyn jumped for it across the bed. He read wonderingly:

Dear Mr. Gosseyn:

When I heard the news, I knew there would be a search for you. So I immediately destroyed the card, showing you were registered in this hotel, and substituted one for your room, 974, under the first name I could think of: John Wentworth.

Then, after I was off duty, I let myself into your room with a pass key, and found you lying there with that record going. I removed it, and recorded one of my own with the intention of counteracting all depressing effects.

I shut that off the last time I was up to look at you, as I understand you can make a person lightheaded by feeding them too much optimism. I hope that I struck a balance, as you'll need all your good sense in the fight ahead.

This is written by one who intended to try the games next year, who places him-

self completely at your service, and who dares to sign himself,

With all best wishes,
Dan Lyttle
(Desk clerk on the swing shift)

P.S. I'll be up again when I go off duty at midnight. Meanwhile, read the morning paper. You'll see then what I'm talking about.

D. L.

Blankly, Gosseyn reached for the paper, and unfolded it on the bed. The four-inch caps of the headline glared up at him:

GAMES MACHINE DESTROYED

He blinked. And snatched the paper, read by visual leaps that took in whole paragraphs:

. . . Fired at the palace and . . . simultaneously broadcast warnings about a mysterious attack against. . . . Venus (No such attack . . . taken place. See Radio Exchange report . . . page 3) . . . Authorities decided . . . insane . . . following so soon on assassination of President Hardie . . . evidence linking the Machine . . . accordingly destroyed.

For an hour . . . Machine broadcast . . . incomprehensible message to Gilbert Gosseyn, whose picture is reproduced elsewhere . . . this page . . . Previously exonerated . . . Now to be picked up again for further questioning. Arrest on sight—

As he read, Gosseyn remembered second by second what the Games Machine had said over the radio. Now, swallowing hard, he looked over at the photographic reproduction. It was a head view only, and was his face all right. But there was something wrong with it.

Seconds passed before he was able to analyze the wrongness. He laughed jarringly. They had taken a photograph of the corpse of Gilbert Gosseyn I.

The amusement that came was so grim, that he laid the paper down, staggered over to a chair, and proceeded to feel sick with reaction.

He had nearly killed himself. It was so close that it was as if he had died; and this was resurrection. A spasm of awful rage wracked him: What did the Machine mean, ordering him to commit suicide, and then calling it off because "your third body has been accidentally destroyed!"

Accidentally destroyed! What a wretched explanation. Of all the organic matter in the world, that body of Gilbert Gosseyn III should have been protected against accidents.

Now, he was the one man out in the open against a solar system controlled by the gang. Or wait! *Wait!* He mustn't forget the aliens? He mustn't forget the shells that had been fired at the Games Machine from the direction of Venus, now more than eighty million miles away. The shells that had ploughed through ninety feet of grain steel as if it was paper!

Gosseyn grew calm before the very magnitude of the forces that were against him. There must be no error in any move he made now. One mistake, and death would strike him.

An emptiness assailed him as he realized that this time it would be final. And yet it was a heady feel-

ing, too. It tightened the muscles played across his stomach, hardened his face, and narrowed his eyes.

"First move," he thought, "get the Distorter. Then learn how to use my extra-brain."

Or was that last possible? Could he ever do that alone? He who had thought and thought about it without once producing the slightest apparent effect on that special part of his mind.

And what about the secret group opposing the gang? And the invisible chess player, the superbiologist, who had created at least two living bodies to maintain the continuity of the personality of Gilbert Gosseyn, adding a special brain —all these were people he had to take into account.

For an hour Gosseyn sat while the late afternoon yielded to twilight; and the line of his thought was: Where would I conceal a body if I didn't want it discovered by people who had access everywhere? Some absolutely obvious place.

Prescott had said that the gang had searched remote meteorites, caves, other aspects of reality, wherever that was. Gosseyn mustered an ironic smile. "I am not," he thought decisively, "going to get lost in those depths just now" . . . reality, the basic wholeness of matter and the universe.

There were a number of things to do first.

He went to the phone; and when the switchboard robot answered, he said:

"Connect me with the desk."

A pleasant male voice replaced the womanish contralto of the switchboard. And Gosseyn said:

"This is John Wentworth."

There was a pregnant pause at the other end; then:

"Yes, sir. How are things? Dan Lyttle at this end."

It was a smooth response, which gave away nothing.

"Can you come up here for a minute?"

"I'll be right up, sir."

Gosseyn waited expectantly. He remembered the clerk who had registered him as a slim, tall chap with nice features and dark hair. Lyttle in the flesh was somewhat thinner than Gosseyn's memory of him, rather weak-looking for the tough job Patricia Hardie had assigned the two of them. He showed, however, many characteristics of null-A training, particularly in the firmness of his jaw and in the way he held himself.

"I'll have to hurry," he said.

Gosseyn frowned at that. "I'm afraid," he said, "the time has come for special risks. I have an idea an effort will be made to dismantle the destroyed Games Machine as swiftly as possible. If I were confronted with such a job, and wanted it done fast, I would publish a notice to the effect that anybody can have what he wants provided he carts it away immediately."

He saw that Dan Lyttle was staring at him, wide-eyed. The young man breathed:

"Why, that's exactly what's been done. They're stringing up masses

of lights, and trucks are arriving and leaving every second. They say that an eighth of the Machine is already gone, and that . . . why, what's the matter?"

Gosseyn couldn't help it. He was shuddering. He had talked so glibly about the Machine being destroyed that the reality of that destruction hadn't penetrated.

It was penetrating now, the tremendousness, the finality of it. Without having to think about it, he new it would never be reconstructed. Like the gorgeous cathedrals and temples of far-gone days, the Machine was product of a creative impulse, a will to perfection, which, though not dead, would not repeat itself in the same fashion, no matter how complete was the victory over the forces that had smashed it.

Gosseyn felt a personal anguish. The Machine was gone after more than three hundred years of controlling men's lust for power. And hour by hour, all that it stood for, was going with it.

It was surely a black day for A.

Jerkily, he forced the thought aside. "There's no time to waste," he said swiftly. "If the Distorter is still inside the Machine, we'll have to go after it at once."

"But I can't leave until twelve."

"Why not?"

Dan Lyttle looked distressed. "There's been a preliminary warning about you to all hotels; and the slightest wrong move would be noticed. I'm sure of it."

It was an angle that hadn't occurred to Gosseyn. "Can't you pretend to be sick?"

Lyttle smiled wanly. "We have a little system in this hotel. Anybody who wants leave states his reasons into a lie detector and—"

Gosseyn cut him off: "What about your car? Have you got a car?"

The young man's smile was sickly now. "It's locked in an automobile parking space on a time lock set for midnight." He broke off anxiously: "I'm sorry," he said, "but I can't see any way but for us to wait. In my car, you'll be reasonably safe. But on foot, or on a public vehicle —I'm sure you'll be caught right away. The streets are absolutely swarming with men. It's even possible I ought to go after it alone. I swear I'll do my best."

"I have no doubt of it," said Gosseyn grimly. "But what you haven't realized is that there's a billion dollars worth of material in the Games Machine.

"The junk dealers, the organized contractors and other material groups will commit murder to get their share. They'll gang up. They'll hire gunmen to fight off the small competition. I assure you, you'll need me there to get you through; and I'll need you. And now you'd better get back to your job. We've got five hours to pass."

It was going to be a long, long evening.

At first he didn't know what to do with himself. His original plan had been to wait until dark, and then go out. He hated to waste a single minute of the extra time. But what to do?

Gosseyn paced the room. Abruptly, he saw the newspaper; and, snatching it, read captions, searching for bits of information. But there was nothing in the news that he did not already know in essence. What did strike him was the restraint of the newspaper account, as compared to the wild talk on the radio the day before. A master's hand had obviously taken control of the gang's propaganda.

In the middle of thinking about it, the realization came that he was ravenously hungry. He ordered the food sent up to his room. By the time it arrived, he was planning his evening.

He looked up a number. "I want a visual connection," he said into the mouthpiece, "with the nearest phonolibrary. The number is—"

To the robot in charge at the library, he explained his general wants. Within a minute, a picture was forming on the communicator screen. Gosseyn sat then, eating and looking and listening. He knew very clearly what he wanted: a suggestion as to how he should begin training his extra-brain. Whether or not the subject matter selected by the librarian had any relevancy to that desire was not so clear.

He forced himself to be patient. When the voice began with an account of the positive and negative neural excitations experienced by the simple life forms of the sea, Gosseyn settled down determinedly.

He had an evening to pass.

Phrases came to him, clung as he turned them over in his mind; and then faded out of his consciousness, as he reluctantly discarded them. As the voice traced the growth of the nervous system on Earth, the pictures on the communicator changed, showing ever more complex neural interconnections, until finally the comparatively high forms were reached, complex creatures that could learn lessons from experience:

A worm bumping two hundred times against an electric current before it finally turned aside; and then, when put to the test again, turned aside after sixty shocks— A pike separated from a minnow by an almost invisible screen nearly killing itself to get through; and then, finally convinced that it couldn't, not even the removal of the screen made any difference; it continued to ignore the minnow as something unobtainable— A pig going insane when confronted with a complicated path to its food—

All the experiments were shown. First the worm, then the pike actually threshing against the screen; the pig squealing madly; and later on, a cat, a dog, coyote—monkeys put through their experiments.

And still there was nothing that Gosseyn could use; no suggestion, no comparison that seemed to have anything to do with what he wanted.

"Now," said the voice, "before we turn to the human brain, it is worthwhile to note that, in all these animals, one limitation has again and again and again revealed itself. Without exception they identify their surroundings on a too-narrow basis.

"The pike, after the screen was

removed, continued to identify its environment on the basis of the pain it had experienced when the screen was in place— The coyote failed to distinguish between the man with the gun and the man with the camera—

"In each case, a similarity that did not exist was assumed. The story of the dark ages of the human mind is the story of man's dim comprehension that he was more than an animal, but it is a story told against a background of mass animal actions, rooted in a pattern of narrow animal identifications.

"The story of Ā, on the other hand, is the story of man's fight to train his brain to distinguish between similar yet different object-events in space time. Curiously, the scientific experiments of this enlightened period show a progressive tendency to attain refinements of similarity in method, in timing and in the structure of the materials used. It might indeed be said that science is striving to force similarity because only thus—"

He had been listening impatiently, waiting for the discussion on the human brain to begin. Now, abruptly, Gosseyn thought:

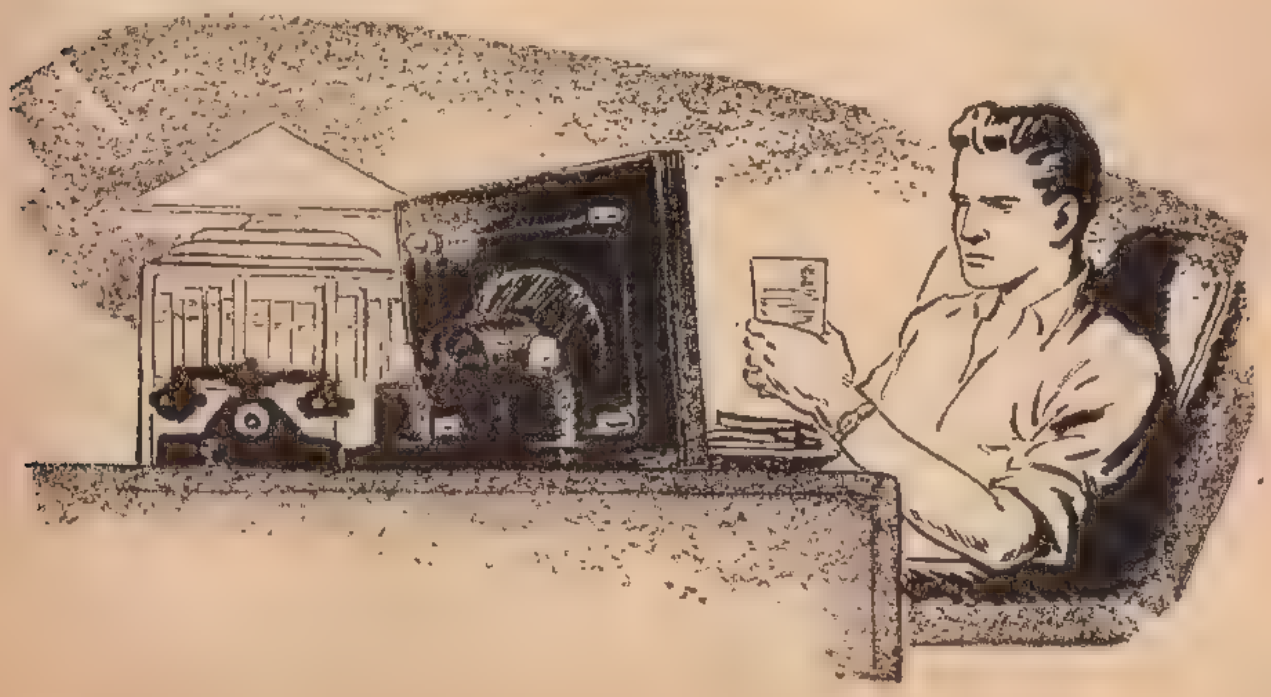
"What was that? *What was that?*"

He had to hold himself in his chair; to relax, to remember. And then, and not till then, did he climb to his feet and pace the floor in the burning excitement of an immeasurably great discovery made.

To force a greater approximation of similarity. What else could it be? There just wasn't anything that offered such a logical continuity of the developing of the null-A idea.

Besides, he had to try something. And if he succeeded he'd have—

The thought dangled. Gosseyn frowned a black, an awful frown of dismay.



What *would* he have?

He began to shake. Because there was nothing. What good was similarity to him, except in a kind of a way?

He grew aware that somewhere a clock was striking the hour. Gosseyn glanced at his watch. And sighed like a sick man at the realization of the time that had passed.

Midnight.

XVII.

"In the rough, machine is a label applied to a man-made apparatus for the application or transformation of power . . . Roughly, mechanics . . . deals with dynamic manifestations on all levels: thus we have macroscopic classical mechanics, colloidal mechanics . . . and the sub-microscopic quantum mechanics . . ."

A.K.

Masses of parked cars, moving figures, shafts of near light, a distant blaze, confusion— After they parked their car about a mile from the central glare, Gosseyn and Lyttle followed a thin stream of people for half a mile. They came at last to where other people were standing, watching. That was where the really hard part began.

Even for a null-A, it was difficult to think of a third of a mile barrier of human beings as if each unit was an individual with a personality and a will of its own.

The mob swayed or stood still. It had volitions that began like a tiny snowball rolling down hill, and grew into a landslide. There were gasps as people were crushed by the pressures; there were shrieks as the unlucky lost their foothold, and went down. People must have wondered vaguely at times what it was they were standing on, the soft squashy things they were standing on. But it couldn't have worried them very much.

The crowd was a soulless woman; it reared up on its legs, and stared mindlessly at the ghouls who were feasting on the destroyed symbol of a world's sanity.

Unresting were the ghouls. They piloted swarms of roboplanes overhead, loaded with their loot. But that wasn't so bad; if they had used only that method of transportation, the danger would have been minimized.

They also used trucks. Lines of trucks driven at top speed with glaring lights straight at the fringes of crowd that constantly threatened to overlap the roads. Shaken and frightened, the mob kept its skirts drawn back.

It was along these dangerous byways of humanity that Gosseyn and his companion worked their way towards the Machine. Dangerous? They had to keep their eyes open for rifts in the packs of trucks; they had to strain to see pockets in the masses of human beings, pockets towards which they could run in the desperate hope that they would not be filled up when they got there.

In spite of the hideous risk, it did not surprise Gosseyn that they made progress. There was a curi-

ous psychological law that protected men with purposes from those who had none. The important thing was not to arouse a counterpurpose.

Once, when they were penned in by an apparently endless line of racing trucks, Gosseyn shouted:

"This is the city side. The open fields on the other side probably have hardly anyone in them. When we leave, we'll go that way, and work around to your car."

The young man bellowed in answer: "And to think I believed I could come here alone."

"This," said Gosseyn, "is only the beginning. Wait till we come to the gunmen."

But he didn't say that very loud; and surprisingly it wasn't as bad as he expected. They came to a steel fence that enterprising wrecking crews had put up against the crowd. It was for the most part a successful barrier; and the occasional individual who vaulted over it usually slunk back before the threatening guns of the guards who stood in little groups on the other side of the fence, like soldiers lawfully guarding a property from vandals.

Once more, it was a case of straightforward risk. "Keep close to the road," Gosseyn yelled. "They'll hesitate about shooting at the trucks."

The moment they broke into the open, two guards raced towards them, shrieking something that was lost in the bedlam. Their contorted faces were limned in the fitful light. Their guns waved ferociously. And they went down like briefly animated dummies, as Gosseyn shot them.

He ran on after Lyttle, shocked, wondering at himself. He who had so frequently refused to kill—merciless now.

They were symbols, he decided bleakly, symbols of destruction. Having taken on unhuman qualities, they were barbarous entities, to be destroyed like attacking beasts—and forgotten.

He forgot them.

Ahead was the remnant of the Games Machine.

For hours Gosseyn had tied his sanity to a law of logic. A law which held that a machine which had taken years to build couldn't be unbuilt in twenty-four hours.

He was not quite so right as he had expected. The machine was visibly smaller. But it was the colossal artillery damage that was responsible.

The outer tiers of game rooms were caved-in husks, as if fantastic air pressures had smashed them. And everywhere, thirty, fifty, ninety-foot holes gaped in the gleaming, dented walls. Black, jagged holes that revealed, under the spraying, glittering light, torn masses of scintillating wires and instruments—the outer portions of the nervous system of the dead Machine.

For the first time, standing there, Gosseyn thought of the Machine as a high-type organism that had been living, and was now dead. What was intelligent life but the sensitive awareness of a nervous system

with a memory of experiences. In all the man-known history of the world, there never had been an organism with so much memory, such a vast experience, such a tremendous knowledge of human beings and human nature, as the Games Machine. Far in the background of his mind Gosseyn heard Dan Lyttle cry:

"Come along. We mustn't delay."

Gosseyn recognized that was so, and moved forward, but it was his body that followed Lyttle towards the realization of their purpose. His mind and gaze clung to the Machine.

Seen at closer range, the extent of the salvage work was more apparent. Whole sections had been torn down, were being torn down, were about to be torn down. Men carrying machines and metal plates and instruments swarmed out of dark passageways; the sight of them shocked Gosseyn. In awful revulsion, he compared them to worms crawling out of the dark orifices of human corpses, bloated with their cargoes of dead body matter.

And once more, then, he stopped, stricken by the realization that he was witnessing the ending of an era.

He stood in a gathering mental mist. It thickened instant by instant; its multiquadrillion tendrils hazed the bright reality he believed in. The altar fires of Ā were burning low; darkness was shading the great airy room in which he had spent his life—

Lyttle tugged at his arm. And that jarred Gosseyn as no words could have. Galvanized, he hurried forward, skirting the fiery glare of the truck and plane lights, the blaze of the beacons that poured down from every projection of metal big enough to support an atomic-powered searchlight.

"Around to the back," Gosseyn called. And led the way to the overhanging fold of metal, into which the truck had disappeared with the crate containing the Distorter. As they half-ran, the din retreated somewhat; and there were not so many planes or trucks or men.

There was tremendous activity of course. The hissing of cutters, the clang of metal falling, the confusion of movement—all were there, but in a lesser quantity. For every hundred men and trucks in the front of the Machine, there were a score here, working just as hard, just as frantically, apparently conscious that it was only a matter of time until their easy possession was challenged by irresistible numbers.

And still the din grew less. Gosseyn and Lyttle came to the flange behind which the Distorter had been taken, and saw a scant dozen trucks drawn up against a loading platform. Doors had been cut out of the front of an enormous shedlike room; and from this vast, dim area, men were carrying packing cases, machines, pieces of metal and instruments.

The shed was almost empty; and the crate with the Distorter in it stood off by itself, as if waiting for them. An address had been stamped on it in six-inch black letters:

**RESEARCH DEPT.,
THE SEMANTIC INSTITUTE,
KORZYBSKI SQUARE,
CITY.**

The destination was a source of grim amusement to Gosseyn, as Lyttle and he headed out into an open field with the crate, out into the darkness and away around, down silent streets far from the roar and the carnage around the Machine.

He remembered it again when they reached the car, satirically now. So the Machine had wanted the Semantic Institute to have the Distorter. Well, they could have it. After he got through with it, he'd see that the schoolteachers had their chance.

The professors would no doubt write some learned books about their discoveries. Perhaps they would be allowed to publish them. Perhaps they wouldn't. Gosseyn wouldn't put it past Crang to let them.

He realized that the destruction of the Machine was making him bitter and unnecessarily caustic. He put the dark thought out of his mind.

The car drove presently into the yard of the neat little home of Dan Lyttle. In a vague fashion Gosseyn had believed that Patricia Hardie would be waiting there for him.

She wasn't.

There was an excitement about removing the Distorter from its crate that took away the empty feeling of her not being there.

Briefly, nevertheless, he wondered about the feeling. She had said she would come the next day. It was now—Gosseyn glanced at his watch—5:15 a. m. Kind of early to start worrying.

They laid the Distorter, face upward, on the floor, then sat down and looked at it.

Bright, steely, alien metal—world destroyer! Because of it, the gang had reached into all the high places of Earth, and for long, oh, far too long, it was unsuspected—

His initial capture of the Distorter had proved to be one of the final steps in the crisis of Ā. Because of his action, the Games Machine had felt compelled to do something which it must have known could only end in its own destruction.

Finding itself free, it had broadcast the truth, and brought the Venusian war to Earth. For better or worse, all the forces of the gang and of Ā were now engaged, or about to be engaged.

On the gang's side were nine thousand spaceships, the organized government of Earth, alien science and all the weapons. On the other side was integration of mind and body—and the mysterious cosmic player who had moved first one, then a second Gilbert Gosseyn into the center of the game for interplanetary power.

Sitting there, Gosseyn felt a black dismay. From every logical angle, the fight was already lost.

He saw that Lyttle was tired. The young man's head drooped. He caught Gosseyn's eyes on him,

and smiled grayly.

"I was in such a state of tension yesterday," he smiled wearily, "that I didn't sleep a wink. I intended to buy some antisleep pills but I forgot."

Gosseyn said: "Lie down on the couch, and sleep if you can."

"And miss what you're going to do. Not on your life."

Gosseyn had to smile at that. He explained that he intended to conduct his examination of the Machine on an orderly basis.

"First of all, I want to locate the source of energy used by the tubes, and so be able to switch it on or off. I'll need some simple equipment, and the investigation itself will take time. Show me where you keep the instruments you used for taking your course in semantic physics, and then go to sleep."

In three minutes, he was on his own.

He felt in no hurry. For a month he had moved along at dizzying speeds, and got approximately nowhere. The world of A, which he had once thought he was supposed to save, was crashing, *had* crashed around him.

It was obvious that running could be the slowest method of reaching a destination. Time to learn how to walk.

He counted the tubes that protruded from the face of the Distorter, in one flashing glance: thirty-six lengthwise, twenty-four across, eight hundred sixty-four in all.

That meant that thirty times a day, eight hundred sixty-four different gang men could mingle with the true contestants. And more than twenty-five thousand would survive the thirtieth day, and so be "worthy" of Venus. And that had been going on for years, and assumed that the tubes were of a simple design capable of handling only one person at a time.

Gosseyn had a strong conviction that they were anything but simple. Since the Machine had once explained to him the effect on itself when the Distorter was in operation, that was not a problem.

Just what did he expect out of this investigation?

A clue, Gosseyn decided, suddenly shaky. Some key to the aliens who had made it. He picked up Lyttle's energy scanner, and began adjusting the meter on it, peering from time to time through the eyehole.

Abruptly, he had it.

He could see into the Distorter.

What made that first observation simple was that all the tubes were opaque. Their intricacies withheld, the problem of organizing the complication inside became a matter of following the wire system. Gosseyn searched for the power source. He didn't have far to go because—*the power was on.*

That rocked him back on his heels. He had taken it for granted that the Machine would have shut the thing off.

Suppose he had absently touched something *live?*

It took ten minutes to convince him that there was no apparent way of switching the power off. It was

on. And meant to stay on.

The Games Machine, of course, would have used energy probers that could short-circuit a wire system right through metal; and so it had solved its special problems. That was the only possible Science 2560 A.D. explanation.

Gilbert Gosseyn, lacking a prober, was stymied.

It wasn't that he couldn't do more on a more risky basis. But he had decided to conduct his examination with the utmost care. And he owed it to Patricia and Lyttle that he adhere to that policy until he had talked to them. Perhaps if he went to sleep, she'd be here by the time he wakened.

But she wasn't. There was no one else around. It was half past four in the afternoon; and, except for the Distorter, he was alone in the house.

It was the time that first astounded Gosseyn. It would of course be the after-effects of the Coue drug. But how he had slept!

Walking into the kitchen, he tried to feel amused about it. But there was no humor in him. Where was Patricia?

She had named this rendezvous herself. She must know where it was.

There was a note from Lyttle on the kitchen table, to the effect that he had gone to work and that he was leaving the car for Gosseyn to use. The note finished:

—what the radio calls "murderous elements" are beginning to sabotage "peaceful production" and they are to be "ruthlessly" put down by the forces of "law and order".

You'll find food all around you. I'll be back at 12:30.

Dan Lyttle.

After he had eaten, Gosseyn went into the living room, and stared down at the Distorter—dissatisfied with his whole position.

"I am here," he thought, "in a house, where I could be captured in five minutes. There are at least two persons in the city—not here at present—who know I am in this house."

It wasn't that he didn't trust Patricia and Lyttle. He had made the assumption out of things that had happened, out of *life*, that they were on his side. But it was disquieting to be dependent again in any way upon the actions of other people.

Gosseyn smiled wryly. He had, of course, become practically a neurotic on the subject of not depending on other people.

No, it wasn't distrust. But suppose something had gone wrong. Suppose, at this very minute, information was being pressed out of Patricia about where he was, about the Distorter.

He couldn't go out until dark. Which left the Distorter. Undecided, he knelt beside it; and, reaching gingerly forth, he touched the corner tube nearest him. Just what he expected he wasn't sure. But he was prepared for a shock.

The tube was vaguely warm against his fingers. Gosseyn caressed it for a moment, rueful,

irritated at his advance fears.

"If I decide to leave in a hurry," he thought, "I'll grab a handful of tubes, and take them along with me."

He stood up, more cheerful. "I'll give her till dark." He hesitated, frowning again. Maybe he'd better get those tubes now. They might not come out easily.

He was sitting, examining the Distorter again through the scanner when the phone rang. It was Lyttle, his voice shaky with excitement:

"I'm calling from a pay phone. I've just seen the latest paper. It says that Patricia Hardie was arrested an hour and a half ago for —get this; it's monstrous—the murder of her father. Mr. Wentworth"— Lyttle's question was strangely timid—"how long does it take to make a null-A talk?"

"There is no set time," said Gosseyn.

He was cold, his mind like a steel bar that had been struck a mighty blow; and was now vibrating strongly in response. What was it she had said: His release a political move. So must her capture be, or they wouldn't have announced it. They would have killed her without mercy.

Who could such a political maneuver be directed against, when the entire Solar System was in their grasp?

The whole business was growing more fantastic by the hour. And more deadly.

That chilled him again; and he remembered Lyttle:

"Listen," he said tensely, "I'll have to let you decide for yourself whether or not you stick to your job until midnight. If you know somewhere that you can go, go at once. If you feel that you have to come back here, come with care. I might or might not leave the Distorter here. I'm going to remove some tubes from it, and go, well, never mind. Watch the Careless-Guess ads in the paper. And thanks for everything, Dan."

He waited, but when there was no comment, he hung up. Straight for the Distorter he headed. The corner tube, like all the others, projected about an inch above the metal. He grasped it. And pulled at it with a slowly increasing pressure.

It wouldn't come out.

He reversed his effort. Pushed instead of pulled. There was probably a catch that needed releasing.

The tube clicked down. There was a sudden, sharp strain on his eyes. The room wavered.

It *what?* His amazement was conscious, a piercing thought; and the answer, the realization of what was happening equally clear.

Wavered, vibrated, trembled in every molecule. Shook like an image in a crystal-clear pool into which a stone had been violently tossed.

His head began to ache. He fumbled with his fingers, searching for the tube, but it was hard to see. He closed his eyes briefly, but it made no difference. The tube was burning hot under the fingers with

which he tried to pull it back into place.

He must have been dazed because he swayed, and fell forward, bumping against the Distorter.

He had a strange sense of lightness.

He opened his eyes in surprise. He was lying on his side in utter darkness; and in his nostrils was the rich odor of growing wood.

It was a familiar heavy scent. But it took Gosseyn a long moment to make the enormous mental jump necessary to grasping the reality of it.

The odor was the same as had assailed him on his futile journey into the tree tunnel behind Crang's apartment on Venus.

He scrambled to his feet, almost fell as he stumbled over something metallic. And then fumbled against first one upcurving wall, then the other. And there was no doubt.

He was *in* the tunnel of the aliens.

On Venus!

XVIII.

"Nevertheless, the consuming hunger of the uncritical mind for what it imagines to be certainty or finality impels it to feast upon shadows—" E.T.B.

The burst of energy that had galvanized him into verifying where he was, subsided. Gosseyn sat down heavily. It was not altogether a voluntary action. His hands were shaking; his body quivered; his knees felt weak.

He realized he was a badly scared man. Curiously, after a moment, that braced him, because he got a sardonic notion about it. The line his thought took was: Gilbert Gosseyn, superman, frightened. Nonsense.

And it *was* nonsense suddenly. The strength crept back into his body. And slowly a co-ordinated interest towards his surroundings built up in him.

He had already noticed it was dark. Now, he realized it.

Darkness! Shadowness, unrelenting darkness. It pressed against his eyes, and into his brain. He could feel his clothes against his skin, and the pressure of the wood floor. But in this night they could have been vagrant titillations experienced by a bodiless entity. In this unrelieved blackness, substance human or unhuman was almost a meaningless term.

"I can," Gosseyn told himself, "last two weeks without food, three days without water."

He recognized that he didn't really feel as hopeless as that, in spite of his memory of miles of black tunnels. He didn't feel hopeless because there was a thought inside him about the aliens and the Distorter:

They wouldn't have focused the Distorter on Earth on just any part of this Venusian tree tunnel. It must be near some special point, easily accessible from where he was. The finding of that point would be an inevitable product of his own care and patience.

He was about to climb to his feet

when for the first time, the very first time, the transportation angle of what had happened, struck him: He who had been on Earth a minute before was now on Venus.

Gosseyn remained sitting, but rigid now. He could feel himself blench.

"What have I run into?"

The non-Newtonian physics of the Solar System was based on atomic energy, the expansion of gases, and various methods, electronic and mechanical, for using electricity.

Nothing like this! Nothing that included transmission of matter across space—like this.

Shakily, he tried to picture what had happened. The dizziness he had experienced; the way the Distorter had made Dan Lyttle's living room waver—and what Prescott had said: "If two energies can be attuned on a twenty decimal approximation of similarity, the greater will bridge the gap of space between them, just as if there was no gap, although the juncture is accomplished at finite speeds."

The finite speeds involved had been infinite for all the practical purposes of solar distances.

Gosseyn began to feel better. The Distorter had attuned the highly organized energy compound that was his body to this section of tree tunnel; and the "greater" had bridged the gap of space to the less.

Gosseyn climbed to his feet. It was the old, old story, he realized darkly: Fear—the result of mystery, dispelled by a partial knowledge; and his personal sanity preserved by his null-A awareness that the knowledge was but partial.

Aliens, human revolutionaries, human opponents of the revolutionaries, and the invisible wizard who had moved Gilbert Gosseyn and his extra-brain into the center of this game for interplanetary power—these were the players. The seeming chaos was but a reflection of man's confusion about the universe.

He had but to see more deeply, make a few more abstractions, refine his observations another decimal place; and the veil would have been torn aside, one more mystery exposed to the twenty-six senses by which his nervous system responded to its environment.

The thought in its implications was wide enough in scope to actuate the almost automatic "pause" reaction of his nervous system. He grew even calmer.

He remembered the metal he had nearly tripped over when he had first tried to get to his feet. Even in that density of darkness, he found it within seconds. But for a moment, then, as he fumbled over the familiar shape, his A calm was shaken.

The Distorter! His hands probed at each of the four corner tubes in turn. It was the fourth tube that was depressed. *Still* depressed.

Gosseyn hesitated, then pulled it up into place.

Nothing happened.

He pushed it down again. Nothing. He had a sudden suspicion, and tried the tube beside it. It clicked down with an empty sound. And so did the dozen others he

jabbed in quick succession.

The power was off, somehow automatically off. The Distorter, the long run value of which was now proved beyond all price, was of no immediate worth to him.

Tense with the consciousness of the prize in his possession, Gosseyn picked it up, and started slowly along the tunnel.

"A thousand steps," he decided. "I'll walk a thousand steps in one direction, then come back and walk a thousand in the other direction."

The tunnel would wind, of course. But at such short distances his mind would be unerring in its memory of every slightest turn. And besides, he might find what he was looking for long before he got to the end of his planned distance.

As he rounded a sharp bend in the tunnel, after approximately three hundred steps, he saw a glimmer of light.

Gosseyn stopped short, his nerves tingling. For a moment then, he thought he had imagined the light, so dim was the suffused glow of it.

But there was no mistake, though it was so vague that he almost had to strain to be aware of it. It was a reflection of a reflection of a reflection. Three more bends Gosseyn rounded, and finally he saw the tunnel was widening.

Even then, the glow, though bright now and dead ahead, was still sourceless.

It seemed to be coming from something that was shining up from a depth. Gosseyn saw that there was a railing silhouetted against the light. He put the Distorter down.

Cautiously he moved forward. At the last moment, he dropped to his hands and knees. An instant later, he was staring between the bars of the metal fence. Staring *down.*

There was a metal pit below him. The metal gleamed dully from scores of atomic lights that blazed at set intervals from the enormous down-curving walls.

The pit was about two miles long, a mile wide and half a mile deep. And, occupying one half of the far-end, was a ship.

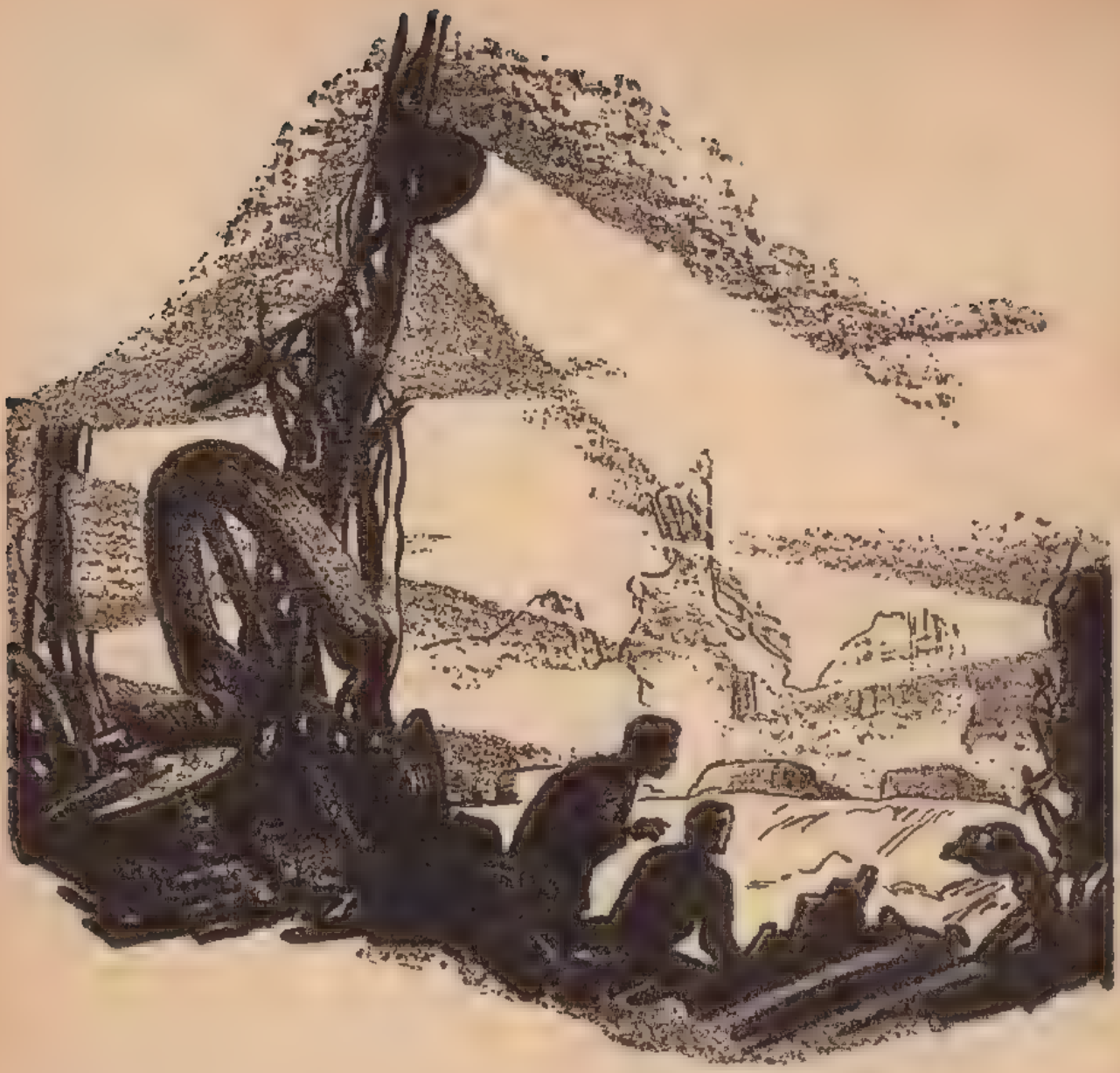
A ship, oh! It was such a ship as men had possibly dreamed of in their wilder imaginative soarings. Spaceship engineers, plan-happy after weeks of poring over ninety-foot draft plans of normal solar spaceships, might have gone home and babbled to their wives: "Now, I'm going to take off five hundred years, and start a million draftsmen drawing plans for an interstellar ship two miles long."

The ship in the pit was just under two miles long. Its ridged back reared up sharklike to within what seemed a hundred feet of the ceiling.

Another ship of its own size could have lain beside it; but if it had, the two of them would have crowded the mile width of the pit.

And if there had been a sister ship, Gosseyn wouldn't have been able to see the activity that was going on below. As it was, distance obscured details.

Tiny figures swarmed on the



metal under the great belly of the ship. They seemed to have contact with something below the floor, for every little while great batches of little shapes scurried from a long line of humps that projected from the floor. As if elevators had come up loaded from floors lower down, and disgorged their cargo.

In the diagonal way Gosseyn was looking down at them, they must have been at least two-thirds of a mile away; little dark things crawling over the metal.

They could have been human.

Funny, how calmly he took that thought. It didn't matter what they were. They existed.

This was what the Games Machine had meant on that dark, stormy night a week ago: (Was it only a week?) "If there is any evidence, you will find it here."

The Distorter, of course, had been proof of a sort. But here was living evidence. *The aliens existed.*

From the stars they had come; nothing less could explain such a ship. From the stars; and now they were waging a secret war against man's civilization, having turned man against man in one of his oldest passions: revolution against things as they were.

He saw, with a start, that the ship was getting ready to leave.

The minute figures below were clambering up steps into it. There were a hundred dark moving shapes —a dozen—none.

A vague throb of sound had come from them, movements, a whisper of conversation. Now, silence settled over the blazing vastness of the pit. Gosseyn waited.

It would be complete night outside. They'd need night for the movement of such ships. In a moment the ceiling would start opening. There'd be a meadow above, camouflage for the hangars below. It would be pushed up somehow.

As he watched, all the lights went out. That, also, fitted. They wouldn't want a light shining up into the night. Sensitive detectors must be probing the skies, to make sure no roboplanes or other solar craft were passing overhead. In a few seconds now—

But it wasn't at all as he anticipated. It was the ship that took on life, not the ceiling.

The ship began to glow. A weak, all-over radiance it was, that outlined every square foot of its body; a vaguely green light, so dim that Earth's brightest moonlight would have been sunbright beside it.

It began to shimmer.

Abruptly it hurt his eyes.

Memory came that the Distorter had affected him the same way. He thought, galvanized: "The ship! It's being attuned to a planetary base of some other star. There *isn't* any ceiling opening."

As swiftly as it had started, the mental and visual strain ended. The green haze below jerked. And winked out.

The great ship was gone.

Gosseyn began to think of this unexpected trip to Venus as the move of moves in the right direction. Accident it had been like so many other forced events of his swift career, but if he had known what was here, he'd have come on purpose. He'd have come, undoubtedly better armed, though even Patricia Hardie's little automatic would be handy in emergencies. He'd have come equipped with tools and very possibly accompanied by allies. But come!

He waited now, still without plans, but with the calm of a man of action who alertly accepted his situation.

The mental attitude was like a cue: Below in the pit, four of the lights came back on.

They were glaring bright sunlike wall lamps, but their white fire was only a partial match for the normal darkness of the pit. Near them, everything was bright. But that brightness dimmed as the glow pushed out through the cubic vastness of the hangar.

Hundreds of acres in the center and between the lights along the

walls, were deep in shadow. There must be some way of getting down.

In the now vague reflected light all about him, he followed with his gaze the railing through which he was peering. It seemed to run right around the pit.

Somewhere along it would be something that gave access to the pit. A stairway, an elevator; *something!*

It turned out to be an elevator. Or rather, a row of elevator shafts with elevators in two of the shafts. Gosseyn tried the door catch of the first one. It slid open without a sound.

He stepped in boldly, and examined the control apparatus. It consisted of a single lever protruding from a gear box. Push it one way, he decided, and the machine would go down. The other way; and it would go up.

Up? He hadn't thought of that before. But—up!

He went out at speed, opened the nearest elevator-less shaft door, and peered up the shaft. Far above he saw a dull glow of light.

It was the work of a few seconds to lift the Distorter into the elevator. It took a moment longer to discover which way to manipulate the lever for up. He left the door open.

Given free rein, that elevator showed skyscraper-devouring speed. He had estimated the light at about a thousand feet above him. After half a minute, he shut off the power, and then went forward in spurts.

But even that way, he swooped ten feet past the lights, and had to come down to it.

It opened out into an unpolished, natural "room" of the tree, splashed with slanting light from above. There were numerous dark corners. Into one of these, Gosseyn parked the Distorter.

He began to follow the corridor that led to the light. It mounted steeply ahead of him, narrowing steadily. Halfway up. He realized that he wouldn't be able to get the Distorter through. That was jarring, but there was no such thing as turning back.

Later, with Venusians to help him, he could come back for it.

During the final third of the climb, he had to use his hands, and clutch at projecting edges of dry-rotted wood to pull himself up. He came out on a lower limb of a titantic Venusian tree, through a hole that was only about twice as big as his body.

It was an unevenly round and natural-looking hole. An animal climbing this tree might go down into it; a man would have to know what it led to before he would think of investigating what was only one hole among the hundred similar holes *in this very tree.*

A null-A would remember its special shape, its relation to the tree it was in and of the tree to the trees and terrain around it.

Gosseyn had no doubt at all that he could find it, if he ever got back into this region. As he would. As he must. No Earthling, no Venusian could be content until that pit was destroyed.

Gosseyn stood and frowned at the hole. The question was not what

he had to do at some future date. But why had no automatic alarms brought overwhelming forces to capture him within minutes of his arrival in the tunnel from Earth? Or even when he used power to actuate the elevator.

Didn't they care? Didn't they *really* care what anybody did now?

Or were their nervous systems, was their science, too, limited by a thousand restraining factors?

Gosseyn decided not to wait to find out. He had already noticed that there was a great meadow on one side of him—where the pit was; in the opposite direction was dense Venusian forest. Not go down to the ground yet.

He ran along intertwining limbs; jumping and climbing from branch to branch and, every little while, edging around the clifflike holes of the trees. It was hard work and, after about three hours, he estimated that he had gone five miles.

The forest was thinning ahead. He could see open stretches of meadow in the distance. He came to a tree, the branches of which did not overlap with another tree beyond.

Without reluctance, Gosseyn began the downward climb. There was a certain thrill to tree running, a thalamic pleasure that, surely, Venusians must often indulge for the sheer animal joy of it. But it wasn't fast enough for war purposes.

He was still heading down when the sound of men's voices below jarred all personal thoughts out of his mind.

Gosseyn pressed his body into an indentation of corrugated bark big enough for two large men. He was, he estimated, about a hundred feet up. At that distance, only occasional phrases reached him from below:

". . . Can't get over it; so this is Venus . . . What a hole . . . We're supposed to help guard this entire territory . . . Putting a hundred thousand men around here, I understand . . . Must be an ammunition dump underground—"

There must, indeed, Gosseyn thought grimly. Such a dump as had never been seen in the history of warfare, and with a super-swift transport system connecting it to its source of supply.

From it, shells could be fired at anything anywhere to which they had been attuned, million ton torpedoes launched at the greatest cities. Nothing could survive the sheer stupendous destroying power that could be projected from the colossal combination hangar and ammunition dump under a meadow five miles away.

That is, nothing could survive but man. Man scattered from his cities into the open. Man roaming the planets, those masses of matter virtually indestructible except by the fury of suns gone insane.

". . . C'mon, let's get going. You two stay here. Yeah, I mean you and Bill."

It was a raucous voice from below that gave the command. After a minute of audible but incomprehensible comments, the main group of voices moved off. There was si-

lence at the foot of the tree for a while; then:

"What a hole. Give me Picadilly Square any time."

"Oh, shut up, Bill." A more educated voice, vaguely familiar.

Silence again; and Gosseyn, in his awkward hiding place, puzzled about the voice's familiarity. He couldn't place it.

There was nothing to do but remain where he was. The men below were undoubtedly armed to the teeth. And, though it was true he had the little automatic he had taken from Patricia Hardie, it was not a weapon that he would care to pit against flame-throwers and sub-machine guns.

If only night would come! He resigned himself to waiting for the night. The glorious dark night of Venus when he would match himself against any human being new to the second planet. He'd need a uniform—he presumed they had uniforms—and it wouldn't hurt to be well-armed for a change. Wouldn't hurt at all.

Night came with Venusian suddenness an hour later; and the men below were cigarette smokers. Gosseyn descended to the ground a hundred feet farther around the bole, and made his way towards the glow points of the cigarettes.

"Frankly, Bill, I don't think you'll mind the cities here. The way they build the houses, with only three outer walls, and every one of them with several acres of garden around. Kind of spreads out the big cities, but it's not bad. I'm the one who ought to be complaining. I've been on Venus for years. And now, bang! I'm cut down to doing dirty work like this."

"Yeah. Some guys get all the breaks. Here we sit out in the open, while most of the boys are living in luxury, each with a house of his own, practically. Funny, the way those Venusians cleared out of the cities when we came."

Gosseyn waited, avaricious for more information about the Venusians. When nothing came, he moved forward, and struck a single crushing blow with the back of his automatic about four inches behind one of the glowing cigarettes. Simultaneously, with his other hand, he took the cigarette.

It was fast, smooth work, with only one flaw: He had expected the sound of the blow to be a dull thump. It was a loud thud with a carrying capacity of at least fifty feet.

"Huh! Bill, did you hear that?"

Bill hadn't. But his companion with the familiar voice, who had, proceeded to show a fantastic quality of suspicious alertness.

A flashlight beam struck Gosseyn squarely, dazzling him. He fired at it. There was a crash of glass, and then before he could shoot again, a voice gasped:

"Gosseyn!"

The recognition stopped Gosseyn, but it was touch and go. His finger was quivering on the trigger, his whole being geared to action.

Only another null-A could have done what he did then. He *transformed* the action momentum into other self-protective action.

With a single synchronized movement, he flung himself full length to the ground. And lay there, tense and intent, his automatic pointing into the darkness where the other man must still be.

Gosseyn had time to realize the reaction-thalamic nature of what he had done. It wasn't a recognition response. He still hadn't the faintest idea of the identity behind that dimly familiar voice.

And yet he knew he would have done it even if he had had time to think. You didn't shoot a man who knew you until you knew who *he* was.

Gosseyn rose to his knees, and warned softly: "Careful! Don't do anything rash. Don't make a sudden move!" Instantly, he crouched to the ground again.

What was he going to do with this semistranger?

"Don't shoot!" It was a half-whisper, frightened, shrill, out of the darkness.

Gosseyn frowned at the palpable fear in the man's voice. He had been afraid in his time, but not like this. He felt repelled by the terror that was here. It was like an unclean thing. He began to regret his mercy. Before he could speak, the man gasped:

"Look, Gosseyn, just go away, and I won't say I saw you or anything. Honestly, I won't. I've been wanting to meet you again, because I want some advice from you. That's proof."

"Advice?"

Who was this fellow?

"Maybe you can give me just a word now." Desperately. "Don't let me go the way you said I'd go—scared, I mean. Scared of my own shadow. Honestly, when I heard you analyze me in Crang's house, I felt kind of empty, Gosseyn. Empty. Because it was true what you said; every word. Man, I'm sorry for hitting you that time, but I'll do anything if you'll help me."

It was the mention of location that brought back the full memory of Blayney, one of Crang's bodyguards, a once recklessly brave man who had started to lose his nerve, after the manner of certain unintegrates.

Gosseyn didn't reply right away. He felt an abrupt depression, a weariness; and a picture came of millions of poor devils like this, ruined by life before they could even realize the meaning of mind organization. It was terrible to look down from his height of superb integration, his prospects of universe power, down into the depths where this human driftwood was struggling in the darkness.

There was hope for Blayney, of course. No brain, however tangled, was ever quite lost. But there was a terrible obstacle in his way: his belief that somebody could help him.

It was the ancient cry of the slave-mind. *"You* help me!" The refusal, the inability to recognize that every man saved his own soul. Nobody, absolutely nobody could save it for him.

There were places to go of course, that could give him the orderly

knowledge he needed. Earth had swarmed, and would again, with free null-A schools. But *he* would have to take the exercises. He would have to follow the instructions, and discover his own aptitudes, learn the individual characteristics of his mind until—

There shall be magic seeming
With far stars nearer gleaming;
And, lo, the clodlike human thing
Shall stand, complete revealed—a king!

Gosseyn said: "Blayney, if I let you go, what will you report to your superiors?"

"That we were attacked in the dark." The man spoke eagerly.

Gosseyn scowled into the night. He felt dissatisfied, not with Blayney's intention. But he frankly doubted the man's ability to put it over.

He realized abruptly there was nothing he could do, being what he was. He had hesitated; and now he couldn't possibly kill the wretch in cold blood.

He said in an even voice: "Leave your guns! And beat it fast!"

When the swift footsteps had faded into the darkness, Gosseyn stripped the uniform from the dead man, took his machine gun, his flashlight, his packsack, and started forth.

He was striding swiftly across the open meadow he had observed in daylight, when an indefinable change in the texture of the darkness and of the silence made him raise his machine gun, and snatch for his flashlight.

He had time only for the movement.

Hands grabbed his gun, his arms, his legs, his head, his body. His struggles were instantly vain.

On a cliff of metal on the planet of beasts, the league ambassador landed. He walked slowly over to the parapet of that vast building, and stared uneasily down at the jungle four miles below.

"I suppose," he thought, "I'll be expected to go hunting with the"—he paused, searched for the right word, then grimly— "extroverts who build hunting lodges as big as this."

A voice murmured behind him. "This way, your excellency. The hunting party will leave in an hour, and Enro the Red will confer with you en route."

"Tell his excellency, the foreign minister of the greatest Empire," the ambassador began firmly, "that I have just arrived, and that—"

He stopped, the refusal unspoken. No one, least of all league agents, turned down the invitations of the reigning big shots of an Empire of sixty thousand star systems, especially when one's purpose required considerable tact.

The ambassador finished quietly: "—and that I will be ready in time."

It was a bloodthirsty business. There were guns for each type of beast, carried by noiseless machines, one machine for each hunter. The robots were always to hand, holding out just the right weapon, yet they never got in the way. The most

dangerous animals were held off by palpable forces, while the hunters maneuvered for firing position.

There was one long sleek powerful hoofed animal, gray in color, which realized after one burst of effort that it was trapped. It sat down on its haunches, and began to cry. Literally cry. Enro the Red, himself, put a bullet through its nearest eye. It pitched over, and lay sobbing and writhing for a minute, then grew still.

Afterwards, on the way back to that gigantic combination hunting lodge and alternate foreign office, the red-haired giant came over to the league ambassador.

"Great sport, eh?" he growled, "though I noticed you didn't shoot much."

"This is my first time," apologized the other. "I was fascinated."

That was true enough, if you thought of it in a certain way. Fascinated, horrified, shocked, disgusted.

He saw that the great man was staring at him sardonically.

"You league men are all the same," he said. "A bunch of cowardl—" He stopped. He seemed to think better of his harsh indictment. "Peaceable!" he said.

"You must remember," the ambassador said coolly, "that the league was organized by the nineteen galactic empires at a time when they were destroying each other in futile and indecisive wars. Peace is the trade of the league; and, like all institutions, it has gradually created men who actually *think* peace."

"Sometimes," said Enro proudly, "I believe I prefer war, however destructive."

The league officer said nothing, but he thought: "This . . . this is the type of man we have to keep in line."

He waited, and presently Enro ceased chewing on his lower lip, and said curtly:

"Well, what is it you wish?"

The ambassador began diplomatically: "We have recently discovered that your transportation ministry has been over-zealous."

"In what way?"

"The case to which I refer is that of a sun system, called Sol by its dominant inhabitants."

"The name does not strike a memory chord."

The other man bowed. "It will undoubtedly be on record in your department, and the problem is very simple. A transit base was established there by your transport department about five hundred years ago without permission from the league. Sol is one of the systems discovered after the agreements were signed respecting the exploration and exploitation of new-found stars."

"Hm-m-m!" The red one's gaze was even more sardonic: and the ambassador thought: By space, Enro did know about Sol! Enro said: "And are you going to give us permission to keep the base there?"

"It must be dismantled and removed," the league man said firmly, "as prescribed by the articles

of the league charter."

"It seems a very minor affair," said Enro thoughtfully. "Leave a memorandum with my transport secretary, and I will have it looked into."

"But the base will be dismantled?" Determinedly.

Enro was cool. "Not necessarily. After all, if it's been there a long time, it might cause considerable dislocation to the transport department to have it removed. If that is so, we would take the matter up with the league, and seek confirmation of our position there. Such incidents are bound to happen in vast stellar organizations. They must be handled in a progressive and elastic fashion."

It was the smaller man's turn to be sardonic. "I'm sure your excellency would be the first to protest if some other empire accidentally added a star system to its possessions. The league attitude is very clear: Those who make the mistake must rectify it."

Enro was scowling. "We will take the matter up at the next league session."

"But that's a year away."

The foreign minister seemed not to hear. "I seem to remember something about this system now. Very bloodthirsty inhabitants if my memory serves me correctly. Disorder or war of some kind going on there right now."

He smiled grimly. "We shall ask permission to re-establish order. I'm sure that the league delegates will not object to that."

XIX.

"In the elder days of Art
Builders wrought with greatest care
Each minute and unseen part
For the Gods see everywhere."

L.

A stranglingly strong hand was clamped tight across Gosseyn's mouth; it was that that made it necessary for him to go on fighting with everything he had.

The very first clutch of their implacable strength had identified his captors as Venusians. But Gosseyn knew with a desperate consciousness that he must let them get the measure of *his* Ā strength too.

Without taking an instant for analysis, the realization had already struck him like a fire that this patrol would not be taking prisoners. Even as the thought came, a voice said quietly from the near night:

"O.K., we've got his weapons. Put a knife into him, spray him, and let's go!"

The black possibility that he might actually be killed at this ultimate moment made Gosseyn intensify his struggle. But even as he fought, all the hands let go of him.

For a moment, it was dazzling; and then: "Thanks!" Gosseyn breathed.

"What's the matter?" said the voice that had ordered his death. Sharply.

The answer came from beside Gosseyn: "His muscles are Ā."

"Oh!"

A pause; then:

"O.K., stranger, start talking—"

For long, as the party headed deeper into the hills, the darkness continued impenetrable. But after about two hours, signals began to drift to Gosseyn's senses. A large camp. There were stirrings and movements, an occasional faint cry that came out of some depth of a child's dream. There was the sound of many people breathing. Suddenly, one of the men whispered in Gosseyn's ear:

"A bomb trench ten feet to your right. Sleep! You're to be sent farther into the mountains, so you'll need all the rest you can get. G'night!"

"We'll have to go back for the Distorter," Gosseyn said.

"Not you," was the reply. "We're taking no risks with you."

The tone of the words amused Gosseyn. But he said nothing. It was just possible they were right although—

He frowned thoughtfully. They'd have a hard time finding the right hole in the right tree. For a long time, after he had lain down on a bed of great leaves, Gosseyn lay awake, thinking over what had happened:

Blayney? More and more he regretted his mercy. It might lose them the Distorter, he realized in an agony of regret. Patricia Hardie—Lyttle—the invisible chess player—

He slept at last, uneasily, conscious of the many, many things he had to do.

Voices! The pleasing murmur of a multitude of different voices—that was the music to which Gosseyn awakened. Somewhere, children where playing; and there was the smell of food in the air. He sat up, and stared lazily at the scene. Men, women, walking, moving, working. A stream he hadn't been aware of the night before attracted his wandering, fascinated gaze.

He washed himself in the thrillingly cool, clear mountain water. As he stood shaking his hands in the air, to dry them, a dozen men came down the embankment to him. Swiftly, Gosseyn was introduced to James Armour, a dark-haired, slim young man of noble countenance; Peter Clayton, mathematician, small and wiry; Karl Mahren, big and blond, a physicist.

His introducer, one of the voices of the night before, a tall, lean-faced individual, paused at that point, smiling:

"The other names don't matter. Armour, Clayton and Mahren are to be your guides. As soon as you've had breakfast, we'd like you to record a very detailed account of your story on an energy sphere, for transmission, and naturally you must now swear to your story on a lie detector.

"But first, breakfast!"

Breakfast was an abundant combination of fruit, cooked vegetables and meat, bread and butter and a hot drink. Gosseyn commented, as a smiling young woman brought it to him:

"You seem to be doing very well in the way of food. Can you keep this up?"

There was laughter, the natural

good-humored laughter of men at ease and in high spirits. It startled Gosseyn. He looked up.

"You know," he said, "you don't act like people who have just been driven from their homes. Have you had some great success that you're keeping from me?"

Mahren, the blond giant, answered that:

"Gosseyn, in less than three days the groups in this area have captured nine hundred machine-guns, four hundred flame guns, eight hundred knives, forty-three roboplanes, one spaceship and several tons of odds and ends including ammunition. In that time we have also killed six hundred forty-eight men.

"We realize the gang will react violently. Bombs, flame, atomic energy—they'll be merciless."

He paused, his face hardening. He straightened perceptibly; he said in a steely voice:

"Many will die. But I assure you, Gosseyn, we shall live through it. And now that the people of Earth know what is going on, the death-defying strength of the Ā system is going to start showing itself. As you yourself have told us, the gang is already having trouble on Earth. It will increase: Supply and factory trouble, transportation trouble—People who try to carry out the will of the gang will be found dead. Agents of the gang, all gang members will be searched out, and exterminated. There will be many exceptions, but only towards the end.

"The fools!" His voice was stinging. "They have nothing that

we can't take from them. And what we have—integration, superiority, consciousness of right—cannot be seized by force of arms."

"I presume," said Gosseyn, "that you are referring to what you can do against human beings. "Have you any solution against the aliens?"

There was silence. Mahren stared thoughtfully at the ground. Finally, one of the men who had not been introduced said:

"No real plans are possible about them until we know what it is they're after in the Solar System. However, you may be interested in the deductions that have been made by our experts:

"First, the word 'alien' seems all wrong There are too many human beings involved. Gosseyn, human beings would not co-operate with nonhumans. That isn't even doubtful. They just wouldn't, that's all

"Contrariwise, it seems fantastic that the plenum is inhabited by human beings only We'll have to let that contradiction remain for the time being."

He went on: "The pit, of course, is a base, a police or military base, or a commercial transit port, a halfway mark to some system too remote to reach easily or at all in one jump by their method of transportation. The secrecy surrounding it suggests other galactic powers who might disapprove of their possession. The word, evidence, fits that explanation Evidence, obviously, to prove to the other powers what is going on.

"However, we mustn't count on that helping us. The very nature of the game that is being played here suggests unintegration on a galactic scale. In a crisis, great powers of that type have a habit of giving away things that don't belong to them, in order to avoid war. Nevertheless—"

For a moment, Gosseyn heard no more. *Because this was the way it would be. This was the way that the intrigue of galactic powers would appear to a race bound to its own sun and planets: mysterious agents, meaningless actions, irresistible weapons briefly unleashed.*

His brain paused there, distracted: Would they really disorganize the Solar System? The answer came inexorably out of the history of Earth itself:

"The method of the old imperial systems," he thought bleakly, "was . . . to set one group within the country against another, and then set up a resident agent or, if possible, a government. To accomplish this purpose, no crime was too great. Ruthlessness was but a facet of policy, individuals and nations pawns to be sacrificed on the altar of expediency."

"As for the destruction of the Games Machine," the speaker went on, "that we cannot regret. Gosseyn! it was not built by human beings. About fifty years ago, a Venusian plan to build something like the Machine for encyclopedic purposes, ended when we discovered that we didn't have enough scientific knowledge to do it.

"The most logical assumption is that your so-called invisible chess

player has been around a long time. Undoubtedly, it was a good thing for a while, but in the long run we want no outsider's mold pressing us into his designs."

In a peaceful glade of Venus, two men fenced with swords. They were very evenly matched; and the flashing of their blades was accompanied by the bright clang of metal repeatedly striking metal. Time after time, each foiled the thrusts of the other. They paused at last, and stood breathing deeply, grinning at each other.

"You did very well, Gosseyn," said the smaller, lighter man. "The grace of your movements was a pleasure to behold. If this repetition of early Ā training for body integration does lead more easily to control of your extra-mind, then the first step has been completely successful. Now, let's try the breathing."

They tried the breathing, then the gymnastic, then the rhythmic gymnastics, and the classical and interpretive dancing. The dancing was a little ridiculous away from a stage setting. But its purpose was too important for Gosseyn to worry about that. When they had finished, after more than an hour, James Armour said:

"In view of your, shall we say, curious upbringing, you may be interested in knowing that for generations before Ā, what you have just done was part of the early training of actors. Did you know that?"

Frowning, Gosseyn examined his knowledge on the subject. "Yes, I know it, Jim," he said finally. "But when I look back to discover how I learned it, I find the source of my information is missing."

Armour nodded. They stood in silence then, Gosseyn concentrating on quieting his emotions. It was not easy after so much exertion, but he was patient; and presently he headed for the hole that had been cut into the base of the tree, where he was to make his first effort to train his extra-brain.

A black curtain hung over the entrance, and then another curtain a few feet farther on. Beyond that, darkness.

But he knew his directions. Ten steps he took, and then felt with his hands for a chair he knew was there. As he sank into it, two thin beams of light focused upon a table in front of him, a table that had been painted black. Spotlighted by the two beams were two wooden blocks, also black.

The method was not a perfect one for insuring freedom from distraction, but it was the best that could be done in a forest.

Behind Gosseyn, Armour's voice came softly:

"Those blocks have been made as similar as our limited equipment could make them. On the physometer, no difference in weight could be detected. The surface temperatures showed no variance. A cathode-ray tube could detect no difference in the color of the two blocks."

Gosseyn listened with half his mind. He had watched the efforts

that had been made to—co-ordinate—the blocks. They had been measured, and tested for balance. Their coarse grained texture had been subjected to delicate energy pressures to bring various differences into apparent similarity.

It was not all that man's civilization could have done, given a laboratory environment, but it was a superlative job for men who had left their homes, carrying only the nearest-to-hand portable equipment.

If only, Gosseyn realized tensely, the searchers would find the Distorter. Once its secrets were known, it could be used to establish similarity to approximately nineteen decimals; and then all he would have to do would be to put it over the top, the extra decimal place. But for three days, no word had come about the Distorter!

Abstractions made in an intense artificial night from two blocks—events in space-time. The time-binding quality was important. All the measurements had taken place—earlier.

Since then, the blocks would have changed slightly. So slightly.

Dust motes must have settled upon them, more on one than on the other. They had been briefly exposed to light. They had been handled, moved. His body heat in the confined area of this room would be affecting them. The light by which he looked at them would be affecting them.

The darkness would already have had an influence, different on each block. Always, there would be that difference. They were three centimeters apart. Under no normal circumstances could they ever have the same experience at such a tremendous distance in space and time from each other.

Two blocks! Wood cubes, painted black. Thin, black coating of paint over the grained, polished surface of the wood. Gravity? That at least must be equal on a twenty decimal basis. Weight, surface temperature, internal temperature—millimeter by millimeter. The grain and its swellings, its airholes, its microscopic variations in construction, despite all appearances of similarity—

For an hour, Gosseyn let his mind haze gently over the blocks, steadily abstracting qualities from them. And thinking always in the Ā fashion that for one thought that he could have about the blocks, there were a thousand beyond the reach of his senses.

At the end of the hour, Gosseyn reached forward, and with the tips of the fingers of both hands, touched the surface of the blocks.

Of all his actions, that was the one that had been most carefully discussed in advance. The secrets of table lifting, the Ouija board, psychic phenomena, long integrated into the Ā system, was now to receive its supreme test.

But the blocks merely moved, as he touched them, as they would have normally to anyone who understood the forces of table lifting. By the fifth day, the certainty of failure was heavy upon the experimenters. But they were determined men; and

it was not until the fifteenth day that everybody finally accepted what Gosseyn had maintained from the beginning: That *he* had to take a risk, and lead a patrol to the tree where he had hidden the Distorter.

There were changes since he had been there before. A hundred thousand men had been moved into a district, which had long worn the appearance of a wilderness. They came upon guns hidden in trees, men in camouflaged forts, shrubs that concealed cannon of unknown fire power.

Gosseyn lay at last full length upon a tree limb from which, through a mass of foliage, he could see the tree in which was the Distorter.

It was one of those warm, perfect Venusian afternoons. All through the previous night, a hundred men and he had worked their way to this vantage point; and they were around him, gazing, too, studying too.

Gosseyn turned to see where they were. After a moment, he smiled grimly. He ought to have known better than to look.

There was no one in sight. The forest might have been empty, so skillfully had the men blended into the admixture of green and brown and gray and yellow that dominated these middle branches of tree giants.

Gosseyn's smile faded. He was not amused by life these days, not even in the most sardonic sense. Even in the remote mountain region, where he had trained, the reports trickled in day by day of personnel bomb havoc. Wary gang men grew warier, and quicker on the trigger. It was harder to capture guns and machines; the price grew higher. All across the vast land spaces of Venus, Venusians lay dead, their bodies burnt by flame, or shot half to pieces. Beside them, gang men sprawled in awkward postures of death and amazement, for they were only slowly learning that this was no walkover, this conquest of a land without guns.

And what about Patricia—after nearly three weeks?

It wasn't sentiment that had made him think of her more and more often in recent days. It was a sense of fairness. Suppose, beyond the curtain of his semi-amnesia, there had been a relationship of marriage in all its meanings.

Difficult, that was, to grasp, but the visualization included a picture of marriage and happiness sacrificed for a cause: he to enter the realm of false memory, and upon all that had happened; she to move dangerously towards final capture by men who would have become more ruthless every hour that their purposes were frustrated.

Death, perhaps, they might have withheld, in the fear that somewhere another body waited to capture the flame of her personality. But torture! It would be so easy for even normal Science 2560 A.D. to chop off legs and arms—and still hold conscious life inside the writhing remnant of body.

They would begrudge her nothing but death—would men who could launch such a murderous war.

Yes, he had analyzed; and, in spite of his conviction that he owed her much, she was not first. He believed his picture of their pre-semi-amnesia life, but there was no question of taking risks for her.

He felt a brief wondering renewal of admiration for the skill with which, for years, she had played her role of unintegrate—brief, grim admiration, and then, he put her out of his mind.

There was only the Distorter. A movement behind him made him turn. It was young Armour.

No words were spoken. Armour handed him a notebook, and Gosseyn read the notations of the different men as to routes of escape.

Gosseyn nodded finally. He knew his instructions: He must go no nearer than the tree adjoining *the* tree, point out the hole from there. As soon as it was verified to be the right one, he was to leave with half the patrol guarding his escape. The other half, including the men who were to use the atomic cutters to widen the hole, were to wait until dark before beginning the actual job of rescuing the Distorter.

There was only one thing wrong with the whole set-up: As he edged carefully across a ninety-foot thick limb, an entire section of the bark collapsed under him.

He fell ten feet onto a smooth floor. Instantly, the long trapdoor above him closed, and he was in darkness. Gosseyn scarcely noticed the absence of light. Because, as he hit the smooth floor, *it* tilted downward.

Tilted sharply, fifty, sixty, seventy degrees. Gosseyn made one desperate leap upwards. His fingers clawed against smooth wood, then slid off into emptiness.

He hit the floor again, hit it hard, and slid down that steep incline. It was not a long journey that he took then, not more than thirty feet. But its implications were bottomless.

He was caught.

XX.

"Consciousness is the feeling of negation: in the perception of the stone as 'gray', such feeling is in barest germ; in the perception of the stone as 'not gray', such feeling is in full development. Thus the negative perception is the triumph of consciousness."

A.N.W.

He had no intention of giving up. Even as he was still sliding, Gosseyn fought to get to his feet, fought to turn, to *return* before the down-bent floor could rise back into place, out of his reach.

He failed. In the very act of whirling, of flinging himself, he heard the ominous click above him of the floor fitting itself back into position.

And still he did not pause. He jumped to the uttermost height of his strength, reaching into the blackness with clawing fingers, that groped only at air.

This time he gathered himself for the fall, and landed on his feet, balanced, conscious that if there was a way of escape, he must find it within minutes.

And yet, for a moment, he forced himself to stand still, to make the pause, to think:

So far everything had seemed automatic. The section of tree limb had caved in because he had put his weight upon it; the floor had tilted for the same reason. The fact that such trapdoors existed was almost paralyzing. Alarms would be ringing. Therefore—get out! Before anybody came. Or never!

From the muffled distance came the dull throb of gunfire. Gosseyn swallowed hard. An ambush!

He dropped to his kness, made a swinging but relaxed sweep of the floor. To his right, he touched a rug. He crawled over the rug, and in seconds had fingered a chest of drawers, a table, an easy-chair and a bed.

A bedroom! There'd be a light switch, perhaps a table lamp or bed light— His swift thought paused there, yielded to action. The wall switch clicked under his fingers; and so, approximately three minutes after his first fall, he was able to see his prison.

It was not bad. There were twin beds, but they were in a large alcove of coral pink, that opened onto a large living room, at least as big, at least as luxurious as the one in Crang's apartment several miles away.

The furniture had the glowing quality of fine wood beautifully finished. There were paintings on the walls—Gosseyn didn't pause to look at them, because his restless gaze had lighted on a closed door. He reached it, gave one vain tug; and then drew back, grim.

It was not only closed; it was locked. And it only seemed to be made of wood. From the feel of the door, as he had tugged at it, under the wood veneer must be metal, solid, unyielding, beyond all his strength and his hope of defeating.

Slowly, the tension faded out of Gosseyn's muscles and nerves. He looked around again. There was an open door in the bedroom alcove, leading into a bathroom. He had already glanced into it. Now, he went into it.

It was a be-mirrored affair; the mirror effect extended even to the tub and the floor. It was startling, but if there were any concealed doors in that shining interior, Gosseyn was not able to find them.

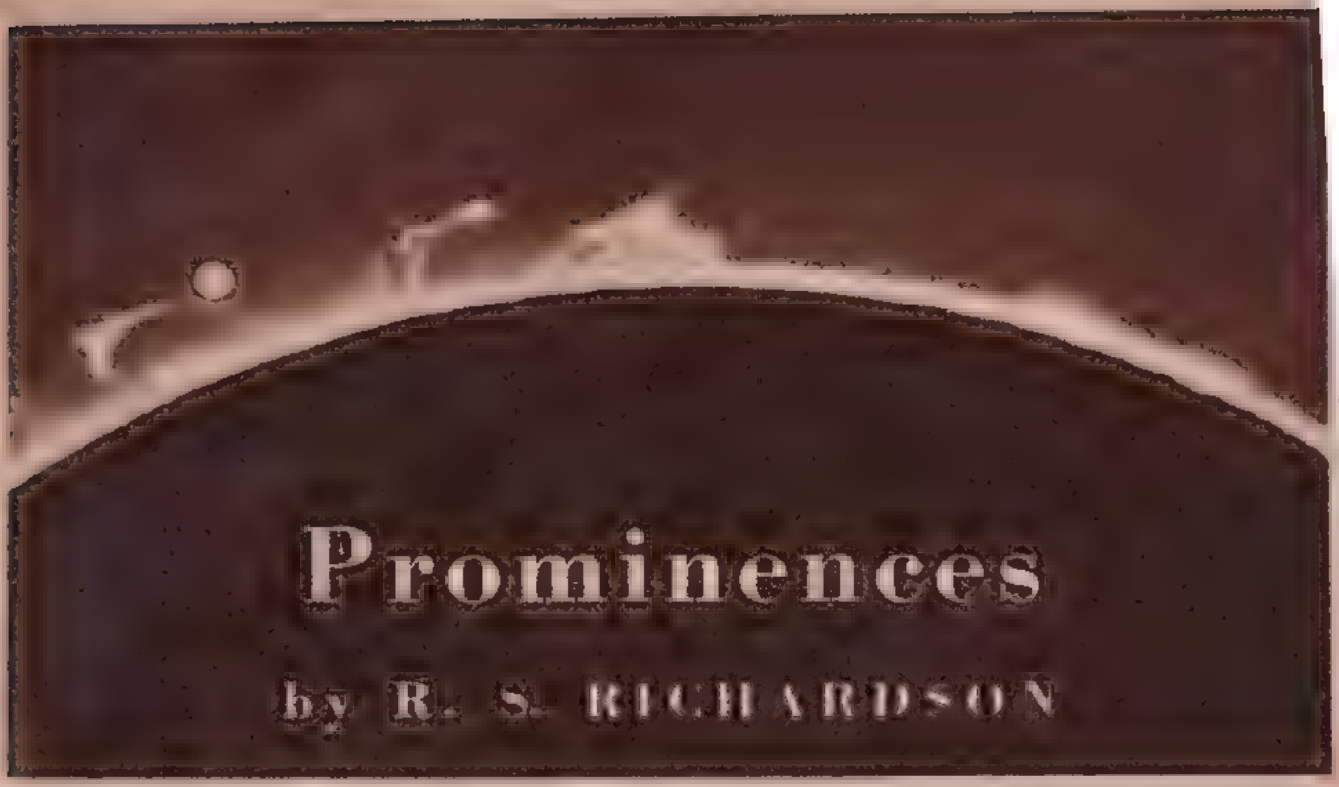
The walls of the alcove and the living room seemed equally solid. But he was patient now, and painstaking. He went over them inch by inch, as far as he could reach by putting a chair on a table. He took down the paintings one by one, noting briefly that the scenes were all nonobjective and intensely linear, with some oddly clashing color effects.

He forgot them.

When he reached the door, he made every test he knew, for hidden lock releases. He was still fumbling over it, when the sound came of a key clicking in a lock. Repelled, Gosseyn drew back, drawing his guns.

He laughed curtly as the door swung open; and he saw what was waiting there: a small, floating,

(*Continued on page 156*)



Prominences

by R. S. RICHARDSON

***The** only atomic furnace available for detailed study is some 93,000,000 miles away. It's a source of light, and a source of light on many a scientific mystery. And it's built of scientific mysteries, not the least being prominences . . .*

Fig. 1. Prominences—the fiery gas clouds of the Sun. That white dot is the Earth on the same scale. The strangest thing about these prominences is that they are made up of matter falling down!

Photo by R. S. Richardson

I.

Since there is no ceiling on the imagination in a magazine of this type, suppose that we go completely fantastic and assume the very worst possible has happened.

Science-fiction has been rationed!

Hereafter until further notice all stories and articles appearing in Astounding must be confined to material based upon two sciences only.

Trying to decide which two sciences possess the most appeal would certainly be no easy job. If it were put to a vote, however, my own decision would not be long delayed. Without hesitation I would choose electronics and astronomy.

Doubtless many will demand what of chemistry, biology, anthropology, et cetera? To them I can only reply that I am trying to be as objective and unbiased as possible. Personally I go for stories in which

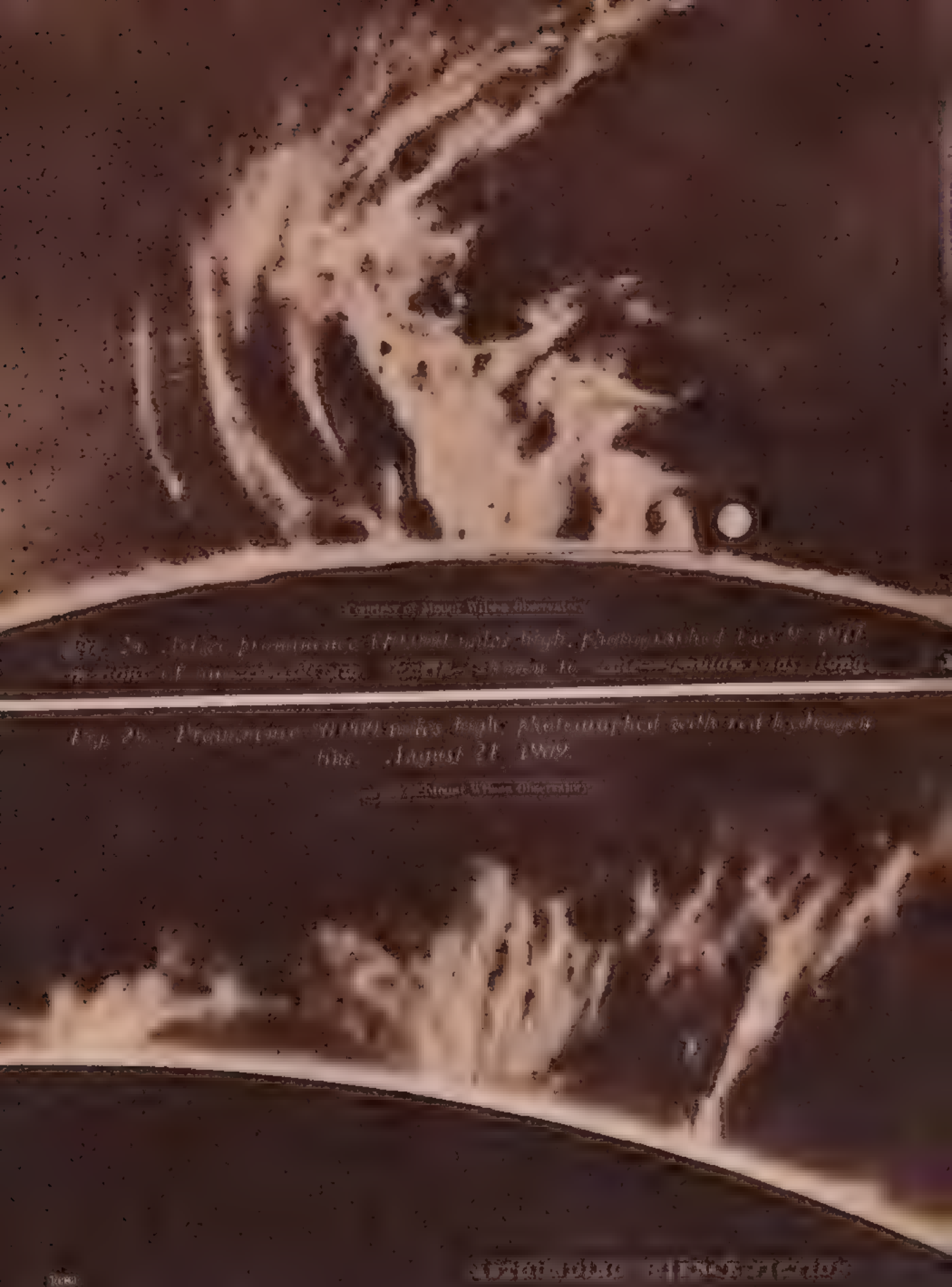


Fig. 3a. Photoreproduction of the drawing of the corona made by the astronomical artist L. L. Trouvelot, made, according to legend under the drawing, "at the total eclipse of July 29, 1878, at Creston Wyoming Territory."

the characters are all neurotic and get hopelessly tangled up in the dark recesses of the human mind. But from any point of view I doubt if we could beat the team of electronics AND astronomy.

The foregoing train of thought was aroused while perusing some photographs of giant vacuum tubes in an old copy of Astounding. Pondering upon the complex innards of these monster electron machines it occurred to me that we have in the Solar System certain bodies which actually thrive in a medium similar in many respects to the highly artificial conditions prevailing within a vacuum tube. They are among the weirdest, queerest, most baffling objects the spectroscope has ever revealed to us: thin ghosts towering thousands of miles high supported upon frail dangling legs. Ghosts that writhe and twist about and materialize out of apparently empty space and vanish while you are looking at them. I refer to the vast clouds of gas above the sun which textbooks call the prominences and which solar men generally speak of among themselves simply as "proms." (Fig. 3.)

Here are some ways that occurred

Courtesy of Mount Wilson Observatory

Fig. 3b. The solar corona photographed at Green River Wyoming, on June 8, 1918. This is fairly typical form of the corona near sunspot maximum—nearly circular, with petallike streamers.

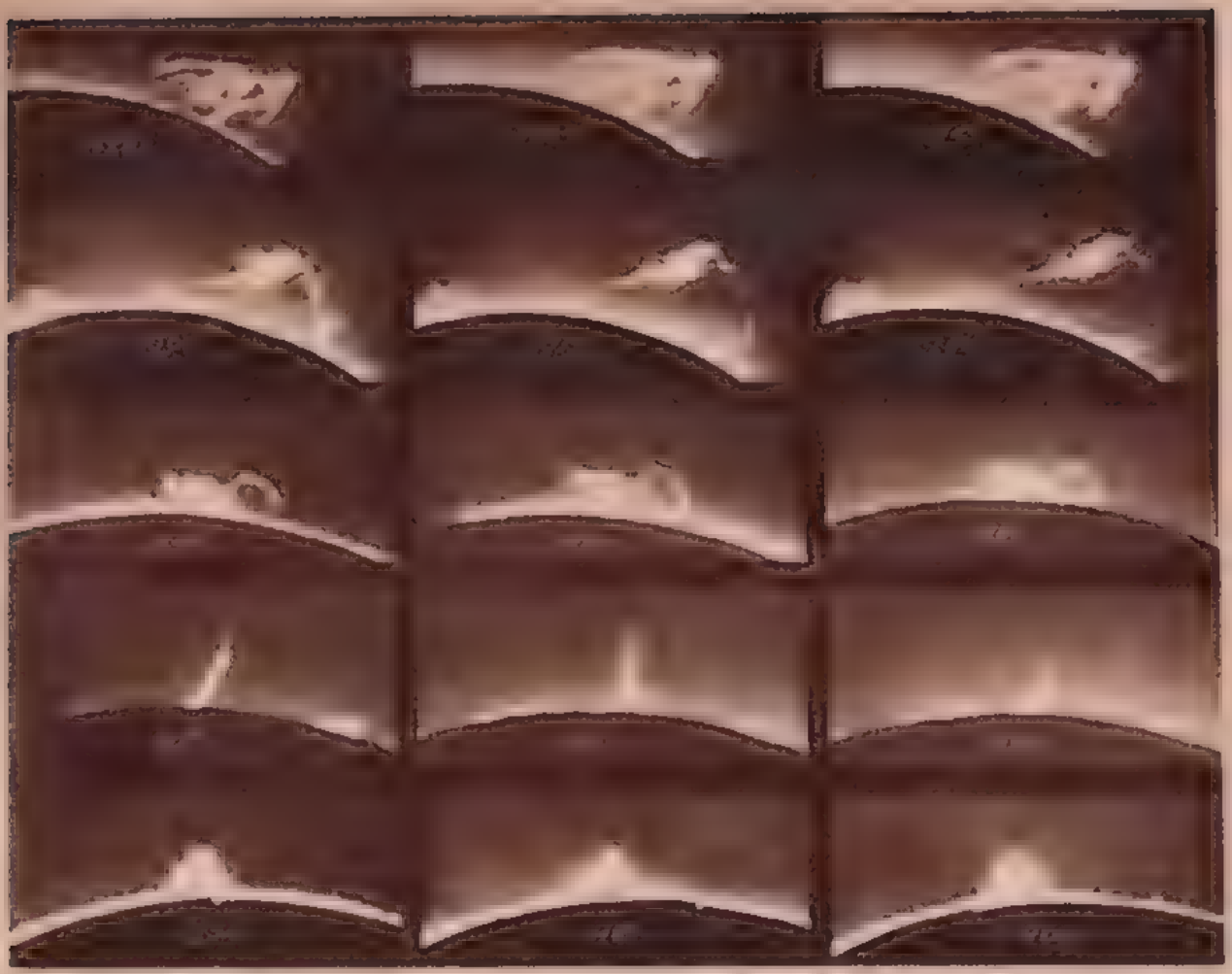
to me in which conditions surrounding prominences resemble those within a vacuum tube.

1. The pressure within a vacuum tube is approximately one hundredth millionth of the pressure of air at sea level.

The pressure at the bottom of a prominence is probably about the same as that within a vacuum tube. Prominences often attain prodigious heights, reaching elevations hundreds of thousands of miles above the surface. Our knowledge of conditions at these great altitudes is pretty shaky, but the pressure must be extremely low, possibly a million times lower than at the bottom of the prominence.

2. The filament in a vacuum tube may be operated at a temperature as high as 2500° K in the case of a tungsten emitter. The tube becomes filled with electrons escaping from the filament.

A prominence is exposed to a



Courtesy of Mount Wilson Observatory

Fig. 1. Types of prominences, showing changes in structure at short intervals. Reading from top to bottom

1. *Active type, which appears to be torn apart by center of attraction*

2. *Eruptive prominences which ascend in a more or less vertical direction.*

3. *Spot prominences, which often have the appearance of closed loops of a fountain or of spikes with external wings generally their shape is best described by the word "splash".*

4. *Tornado prominences, which appear like vertical spirals or tightly twisted ropes.*

5. *Quiescent prominences, which show only minor changes from minute to minute.*

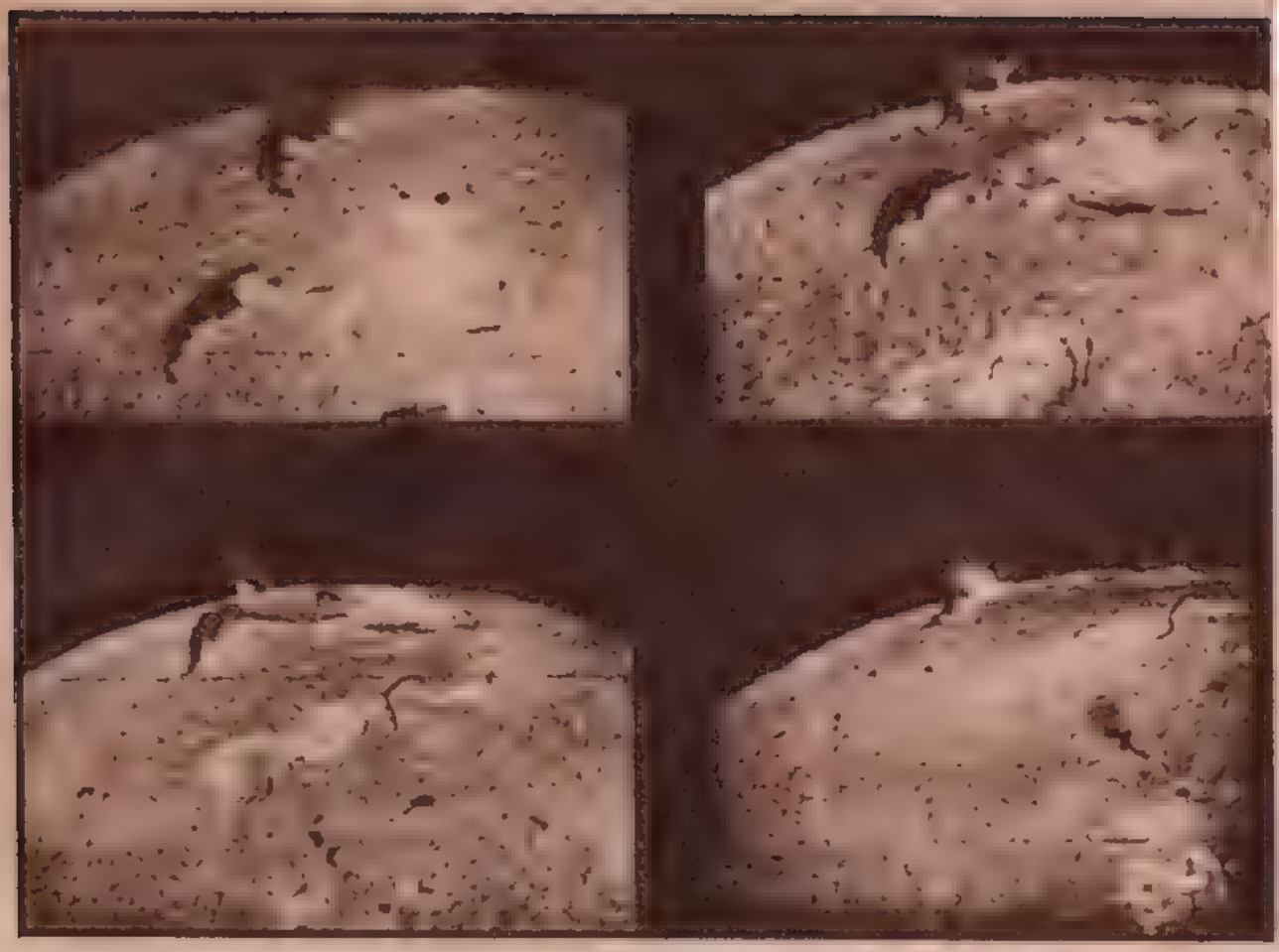
Courtesy of Mount Wilson Observatory

Fig. 5. A direct photograph of the Sun or snapshot on the left, and on right aspectroheliogram taken in light of hydrogen. Long dark streaks are prominences projected on surface of disk.

shower of electrons escaping from the surface of the sun at a temperature of 5900° K. This is the so-called "effective" temperature of the sun and corresponds generally to the temperature of a body as most of us think of it. To the average individual the concept of temperature presents no difficulties whatever. The temperature simply tells you how hot or cold a thing feels. But to a mathematical physicist the temperature may express something quite different from the sensation he experiences upon stepping into the bathtub. Thus according to Eddington, "Radiation of the density and quality which would be in equilibrium with matter at temperature T is said to have the temperature T." Which sounds something like, "A man of the weight and appearance which would be characteristic of people of middle age is said to be of middle age." As we shall see later, the solar atmosphere instead of being at a paltry temperature of about 5000° K as previously supposed is more likely around 1,000,000° K.

3. Minute quantities of inert gases such as helium and argon are sometimes introduced into vacuum tubes to furnish positive ions for neutralizing the space charge.

One of the most conspicuous elements in the upper atmosphere of the sun or cromosphere is helium. In order to detect its presence, it is necessary to move the disk of the sun until the edge is on the slit of your spectroscope. Then looking into the spectroscope in the region of the lemon-yellow you will see a brilliant spike projecting out of the rainbow colored band. That



Courtesy of Mount Wilson Observatory

Fig. 6. A closeup of the Sun's surface as seen in the light of hydrogen showing prominences both on disk of Sun and on edge projected against sky.

golden spike is the famous D-3 line of helium first recognized by Janssen in 1868, and which was not correctly identified until a quarter of a century later

By all the rules and regulations a line that requires so much energy to make it shine as D-3 of He has no business in the chromosphere at all. Worse still, photographs taken during total eclipses show a blue line of *ionized* helium in the chromosphere which requires about twice the energy of D-3. I suppose the astronomers of Galileo's day would have resolutely refused to see such unorthodox lines as these. Nevertheless, there they are, two problem lines which until very recently we were wholly at a loss to understand.

4. In a vacuum tube the electrons are accelerated from the filament by an electric charge placed upon the grid

Often a center of attraction or local electrical charge forms near a prominence and begins to draw streamers down into it. The center of attraction may become so strong that ultimately the prominence is destroyed

You would naturally suppose that a center of attraction would be easy

Courtesy of Mount Wilson Observatory

a 7 In eruptive prominence photographed in light of Ca II. This prominence rose over a large sunspot and sent dozen streamers to a point on the solar equator

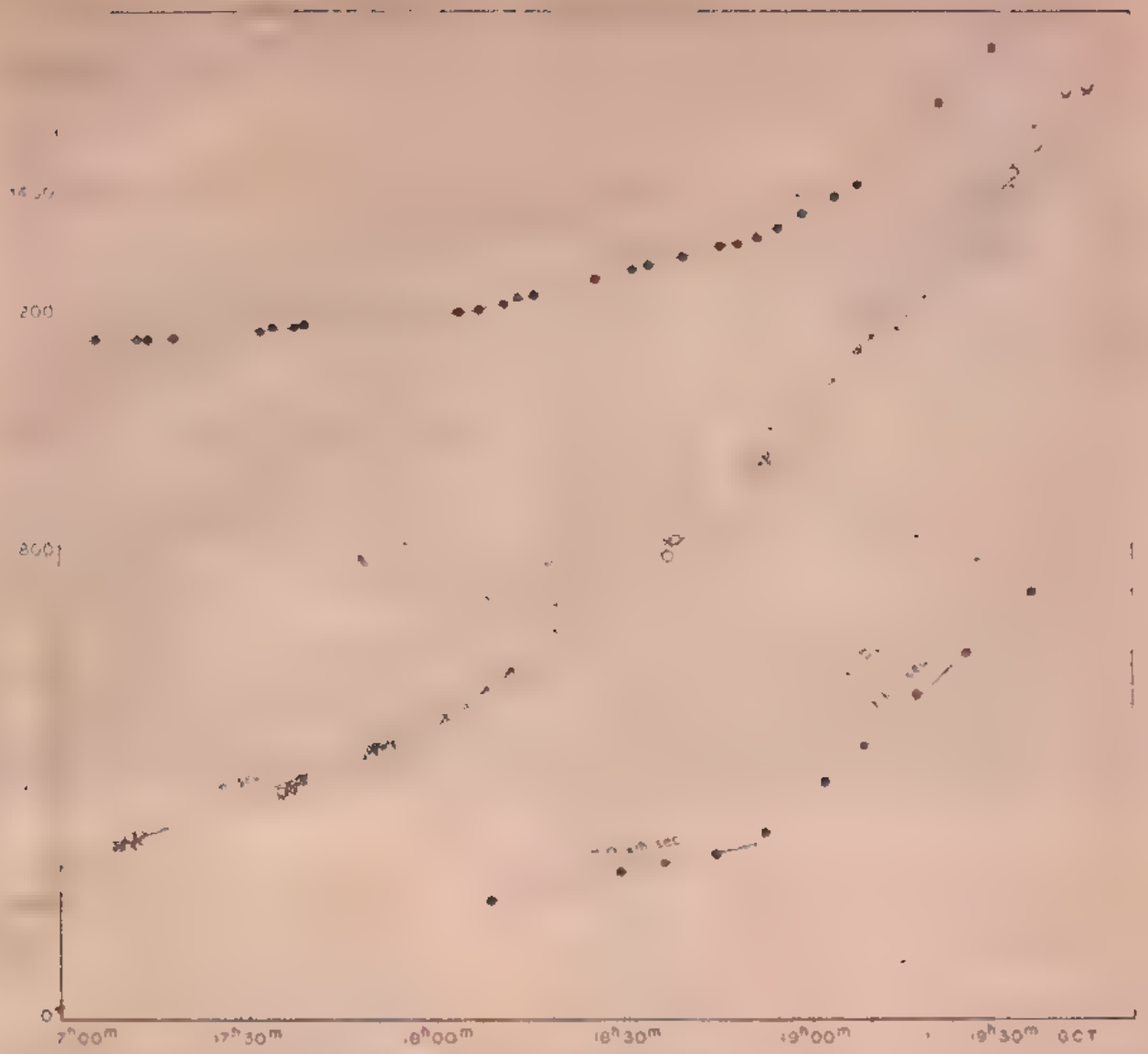


Fig. 8. Time-height diagrams of eruptive prominences, (1) May 29, 1919, (2) July 15, 1919, and (3) March 20, 1938. Note that the straight lines indicate constant velocities which increase suddenly at intervals.

to identify by some sort of distinguishing mark upon the disk, such as a sunspot. On the contrary, a center of attraction cannot be identified with any visible marking. Watching a prom being devoured by a center of attraction is an awe-inspiring sight. The streamers seem impelled by a force which they are utterly powerless to resist.

11.

I suppose the honor of discovering prominences goes to some hairy ancestor whose cave happened to lie in the path of a total eclipse. One clear day while putting the finishing touches on a stone ax he noticed that the light around him was beginning to assume a wan unnatural pallor. Glancing upward

Courtesy of Mount Wilson Observatory

Fig. 9. A comparison of a prominence photographed in hydrogen (top) and ionized calcium. A comparison of the spectrohelioqrams and drawings in light of both elements shows the forms of prominences to be essentially the same in both. The absence of certain streamers and faint clouds from the hydrogen photographs may be due to instrumental conditions. However, there is some reason to believe the effect may be real, since an electrical field would produce just this result

he discovered that something was chewing a big hunk out of the sun god. As the light swiftly faded doubtless he sank to the ground and implored whatever gods may be to get busy and restore conditions back to normal again. The only time I have been in the path of totality was at the eclipse of September 10, 1923, which passed across the extreme southern portion of sunny California. As a light rain was falling at the time there was nothing spectacular to see in the sky. Yet even so the dark shadow of the moon rushing out of the west inspired a feeling of primitive fear that was hard to suppress. Imagine then the terror of a savage as the moon blots out the last ray of sunshine suddenly revealing a fiery red MONSTER blazing above the black disk of the moon. (Figs. 2a, 2b.) Proms may assume various shapes — jets, plumes, fountains, tornadoes, et cetera. The prom wheel

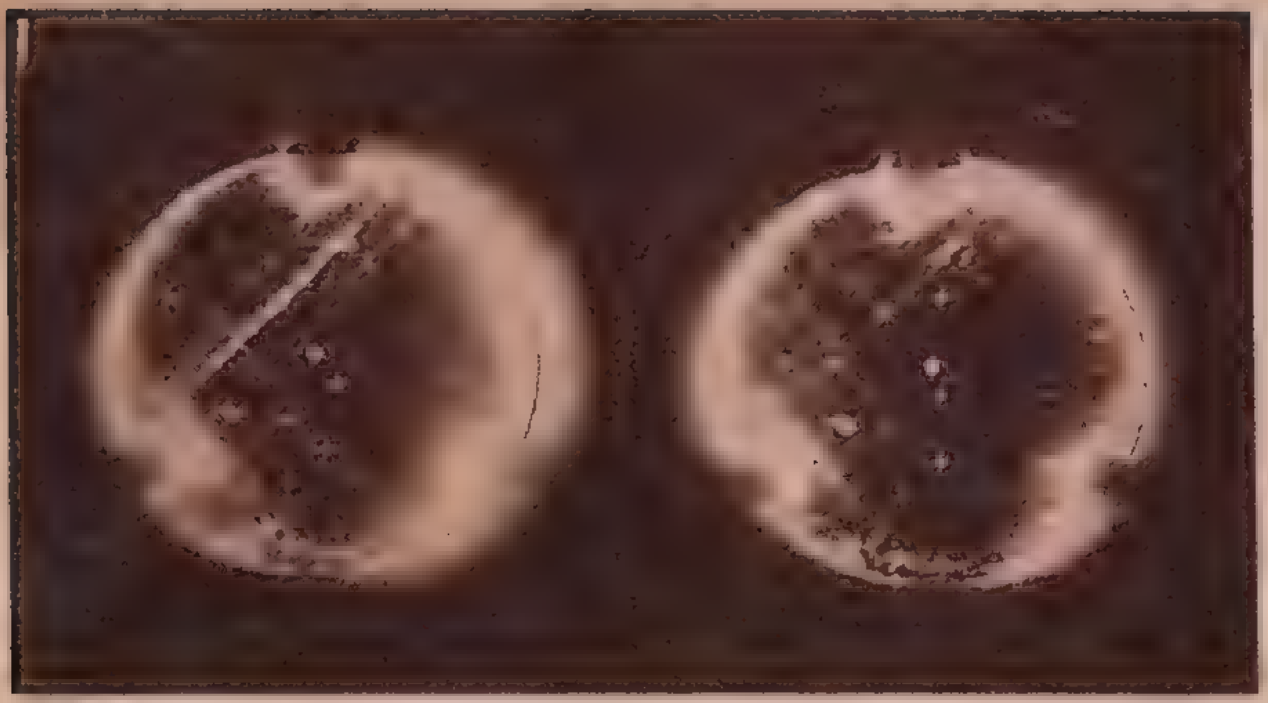
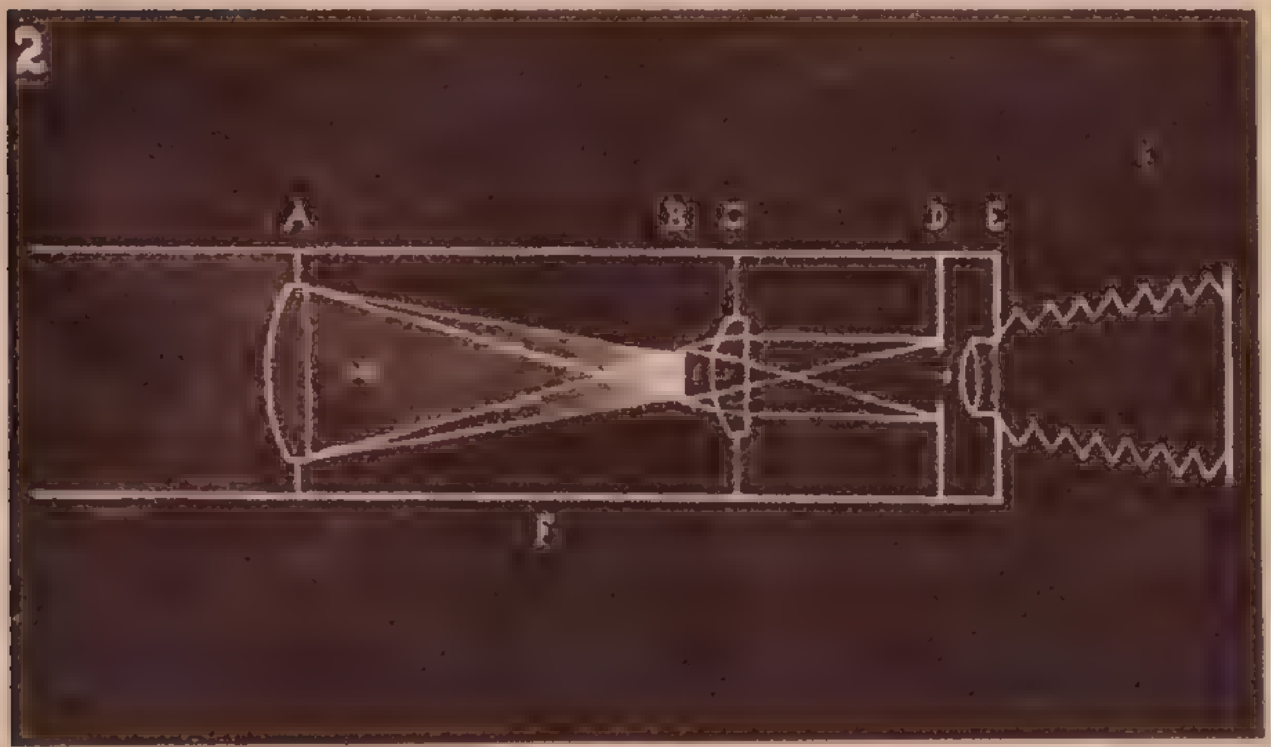


Plate II, Fig. 1. Photographs showing diffusion and veins, with 8 cm. lens.

Bernard Lyot from *Monthly Notices of R.A.S.*

Plate II, Fig. 2. Plan of coronagraph.



Bernard Lyot from *Monthly Notices of R.A.S.*

Plate 12, Fig. 3. The Observatory of the Pic du Midi seen from the top, and the Chain of the Pyrénées.

Bernard Lyot from *Monthly Notices of R.A.S.*

Plate 12, Fig. 4. The Pic du Midi and the beginning of the ascent (1400 m. elevation).

Bernard Lyot from *Monthly Notices of R.A.S.*

Plate 12, Fig. 5. The carriers at 1850 m.

Bernard Lyot from *Monthly Notices of R. A. S.*

Plate 13, Fig. 8. The final coronagraph with the spectrograph on the equatorial of the Pic du Midi.

was disclosed at the eclipse of June 8, 1918 has been called a *heliosaurus*. Looking at the photograph through half closed eyes the resemblance to some prehistoric monster is startling indeed.

Proms are such remarkable looking objects that it is hard to understand how anyone could fail to be deeply impressed by them. Yet a century ago they were practically unknown except for a few scattered reports throughout the literature. In those early days astronomers were greatly concerned with the *where* and *when* of the heavenly bodies but virtually not at all with their *why* and *what*. They considered a total solar eclipse important, not because it offered them a rare opportunity to study the sun's outer atmosphere, but because it enabled them to get an exceptionally accurate fix on the moon! Not until the eclipse of July 8, 1842 did prominences receive official recognition.

This eclipse occurred when Europe was at peace—a remarkable event in itself—so that travel and interchange of ideas among scientific men were comparatively easy. As a result, the eclipse path was thickly studded with astronomers from Spain to Russia. Although these observers must surely have prepared themselves by reading up on previous eclipses, yet they seemed completely stunned when three gorgeous proms burst into

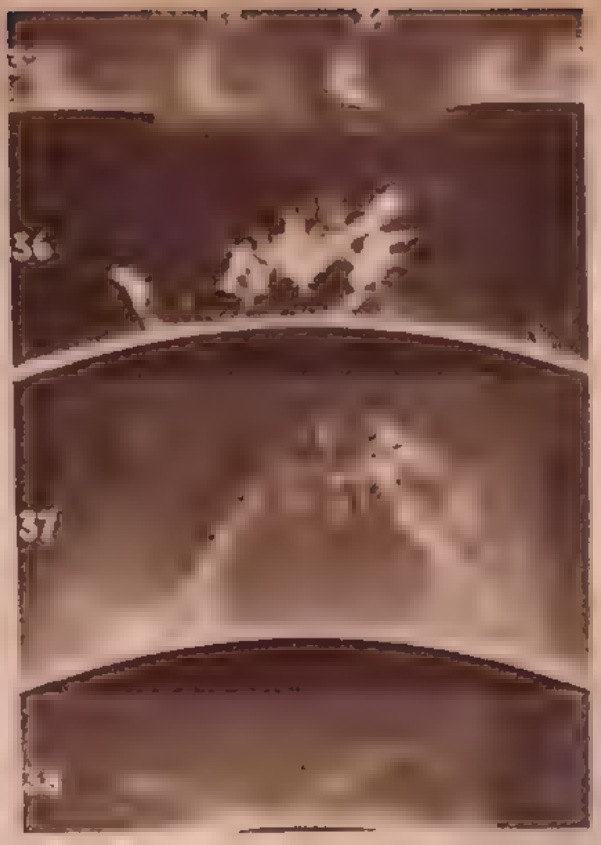
Bernard Lyot from *Monthly Notices of R.A.S.*

Plate 14

Figs. 9, 10, 11. East side, July 6, at 9h, 15h, 17h, 55m.

Figs. 12, 13, 14, 15, 16. West side, July 9 at 10h 30m, 15h 2m, 18h 40m; July 10 at 6h 39m, 12h 10m

Fig. 17. The corona, July 13 at 9h 50m



Bernard Lyot from *Monthly Notices of R.A.S.*

Plate 17:

Figs. 32, 33, 34, 35. Prominence photographed to the North-West, August 27 at 12h 15m; figs. 32 and 35 with the continuous spectrum, 33 with the line D3, 34 with the line Ha.

Fig. 36. Prominence to the East June 12, 1937 at 9h 10m

Fig. 37. Prominence to the North June 10, 1938 at 12h 30m

Fig. 38. Prominence to the West July 19, 1938, at 9h 32m

view. A brief extract from Bailey's account is worth quoting, as being both typical of the effect the sight produced, as well as the flowery language in which astronomers indulge when strongly moved. The italics are Bailey's

"But the most remarkable circumstances . . . was the appearance of *three large protuberances* apparently emanating from the circumference of the moon, but evidently forming a portion of the *corona*. They had the appearance of mountains, of a prodigious height; their color was red, tinged

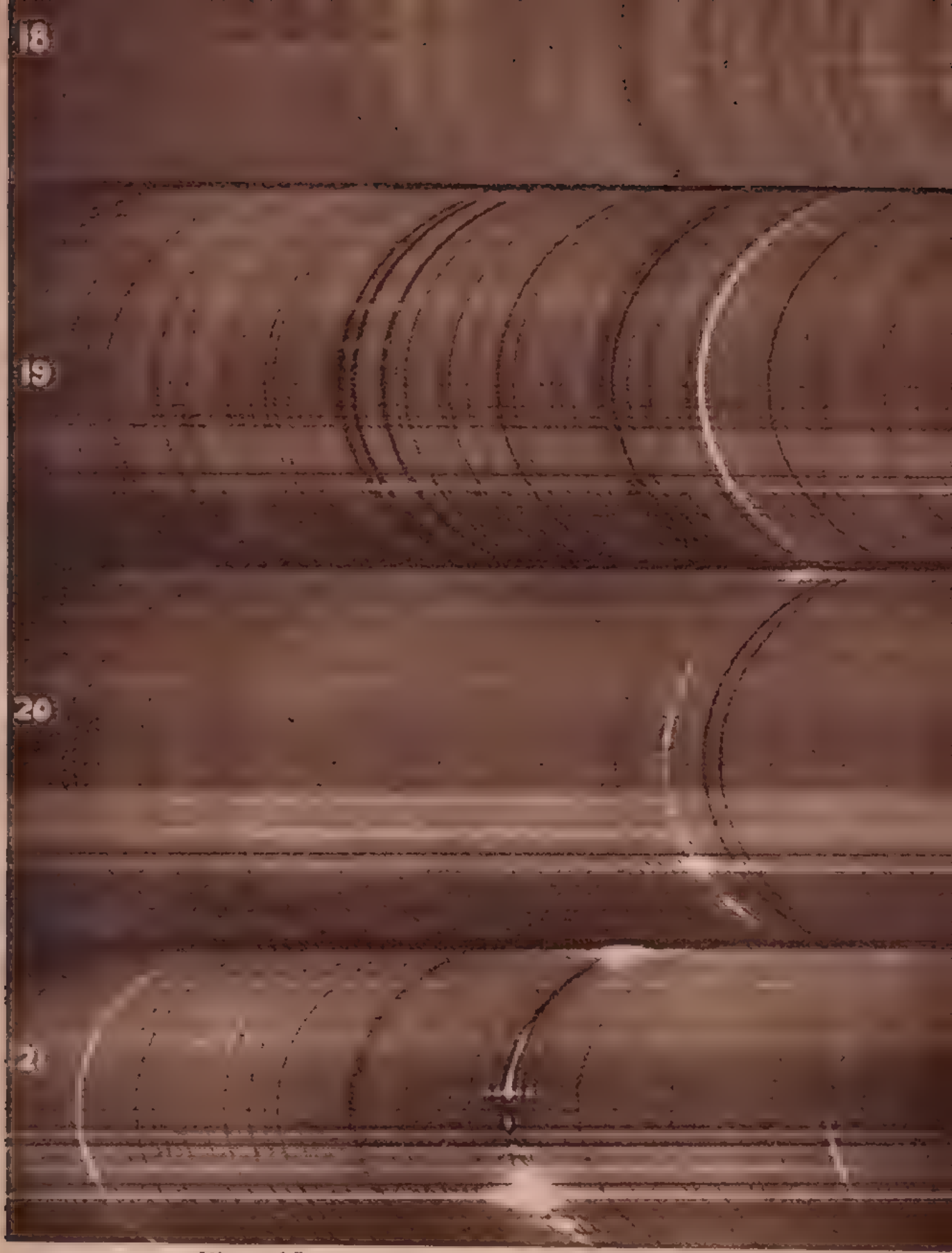


Plate 15: Bernard Lyot from *Monthly Notices of R.A.S.*

Fig. 18. Line λ 3388. Fig. 20. Lines λ 5691 and D. Fig. 19 Line λλ 5110 and 5393. Fig. 21 Lines λ 6371, Hα, and λ 6707

Plate 16: Reprinted by permission from *Monthly Notices of R. A. S.*

Fig. 22. Lines λλ5303 and 5694. Fig. 23. Lines λλ7050, 7065 He and 7254 01. Fig. 24. Lines λλ7775 01, 7892 and 8024. Figs. 25 and 26. Lines λλ10747, 10798, 10830 He and 10938 H. Fig. 27. Distribution of the coronal lines on the West side, on July 18, 1937. Figs. 28 and 29. Infrared lines of ionized calcium and Paschen's series. Figs. 30 and 31. Lines H and K and the Balmer's series.

with blue or purple; perhaps the color of the peach blossom would more nearly represent it. They somewhat resembled the snowy tops of the Alpine mountains, when colored by the rising or setting sun . . . when the first ray of light was admitted from the sun, they vanished with the *corona* altogether, and daylight was instantaneously restored."

Comparing notes afterward, most astronomers agreed that the "protuberances" were real objects and not lunar mountains, of a bluish red color, and that they belonged to the sun. But some refused to be convinced, maintaining with Faye, the comet expert, that they were merely optical illusions or mirages produced by the moon. (Figs. 3a, 3b.)

The bluish red tint is due to glowing hydrogen gas which constitutes practically the entire mass of the prominence. Hydrogen emits a series of rays or spectrum lines, the strongest visible ray being a deep red color, the next strongest blue, the next violet, and so on, down into the ultraviolet. Astronomers may consider themselves lucky that prominences shine by the light of a few definite colors instead of being white or a mixture of all colors like the disk. For there are several ways we can take advantage of this fact to make the prominences visible in broad daylight.

Although interest in prominences was greatly stimulated by the eclipse of 1842, it can hardly be said that our knowledge of them increased by leaps and bounds. As they could only be seen during a total eclipse, and as a total eclipse occurs at any particular spot on the average of once every three hundred sixty years, progress was necessarily slow. Then in 1868 Janssen observed the first prominence with the spectroscope and a new era dawned immediately.

I believe it is a waste of words to give a detailed description of a complicated instrument with which the reader is wholly unfamiliar. Whenever I encounter such a description I always promptly turn to the next page. Therefore, I shall merely mention several ways by which prominences can be observed without an eclipse. Under the finest conditions even the pale corona is rendered visible. But because I know that many people are *not* like myself and are intensely interested in mechanical and optical details, I have given a rather extended account of the development of the Lyot telescope or coronagraph in the last section, which may be read without loss of continuity.

From the airless surface of the moon the sky would appear uniformly black and the prominences and corona visible at all times. On the earth impurities in our atmosphere scatter sunlight making the sky a bluish white and blotting out their relatively feeble glow. Actually the corona is fairly bright, various measurements making it about half the brightness of the full moon. During totality it is such a blaze of glory that observers often feel they should be able to catch

a glimpse without the aid of the moon. Thus it is pitiful to read of Langley, after witnessing a total eclipse from the summit of Pike's Peak, trying vainly next day to discern the corona by standing just within the shadow of a distant cliff. But despite the high altitude and transparent sky he was unable to detect a trace of the streamers he had seen so clearly the day before.

To see the prominences without an eclipse, we need a special kind of a filter that will cut out the blinding white sunlight and transmit only the red ray emitted by hydrogen. Ordinary red filters are not of much help, as they let through a broad band of red instead of the particular narrow strip we are interested in. This is one of the many reasons why the spectroscope is so valuable in solar work—it can be made to act like a highly selective filter.

Imagine yourself looking at the spectrum of the sun. The light is spread out into a long rainbow-colored band. Let us cover the spectrum over its entire length except at the position of the red hydrogen line. Here we will cut a slit a few thousandths of an inch wide. Now we have what amounts to a *monochromatic* or *single ray* color filter—a filter that transmits exactly the light we want and none other. For many years it was by a method akin to this that astronomers had to carry on their study of prominences. It was like watching a bonfire through a narrow crack in a board fence.

The situation was much improved about 1890 by the invention of the spectroheliograph. With this device it is possible to photograph the sun in the light emitted by one element only, usually hydrogen or ionized calcium. The image is built up out of a series of narrow slit widths placed side by side until the picture is complete. Prominences as well as other features can be easily recorded in broad daylight. But such an instrument must necessarily function entirely by photography. This defect was overcome in 1925 by Hale, when he succeeded in constructing the spectrohelioscope, which by persistence of vision does for the eye what the spectroheliograph does by photography.

The latest instrument for observing the prominences either visually or photographically goes under the formidable name of interference polarizing monochromator. It is made from plates of quartz crystal, pieces of polarized, and red glass, and acts like a nearly monochromatic filter. Although the I. P. M. transmits a wider strip of red than the spectrohelioscope, it is easier to handle as there are no moving parts. By attaching an I. P. M. to the eye-end of a six-inch telescope, the prominences show in detail, and when the air is steady the markings at the edge of the sun stand out with a sharpness unequaled in other instruments.

III.

From inspection of the photographs accompanying this article, doubtless you have already formed

a pretty good idea in your own mind of what a prominence is. "Just a lot of cool gas floating around above the sun. Probably not so different from ordinary clouds."

Prominences resemble terrestrial clouds in that they are cooler than the surface below them and they are certainly able to defy gravitation. About the only other similarity is that they can be classified into several different types. It might at first seem hopeless to try to classify such crazy looking things as prominences but they have distinguishing features as definite as cirrus and cumulus clouds. (Fig. 4.)

The diagram shows the various forms prominences may assume as well as the complexity of their motion. Notice how often the gas is moving down instead of up. Somehow we instinctively think of matter as being ejected up above the surface of the sun and not as flowing down upon it. A magician extracting yards and yards of ribbon from an empty hat is an amateur compared with the chromosphere, which can materialize hydrogen and calcium endlessly out of seemingly vacant space when conditions are right. These long streamers pouring from high above the surface down into a center of attraction are called "coronals." Old Sol is a master illusionist but astrophysicists think they have got the answer to this trick. Like most illusions it is fairly easy once you know how.

Proms are usually photographed when at the edge of the sun projected against the sky. On hydrogen spectroheliograms, however, they show distinctly on the face of the sun itself. (Fig. 5.) Seen from above they remind us of long leaves lying across the surface parallel to the equator. Occasionally we can catch a prom just as it is being carried over the edge by the solar rotation, so that part is projected against the disk and part against the sky. (Fig. 6.)

You can follow prominences day after day, from one side of the sun to the other, yet somehow never catch one in the process of birth and development. This is another queer thing about these queerest of objects. They always seem to appear either by rotation from the back side of the sun, or by spontaneous generation during the night when you weren't looking.

Prominences have the form of a thin sheet of flame like that issuing from a fish tail burner in the laboratory. They stand on end considerably above the chromosphere attached to it here and there by narrow columns, like the roots of a tree. A moderate size prom is estimated to have a mass equal to a cube of water nine miles to an edge and a volume about twice that of Neptune. Whether prominences grow by absorption of matter from the chromosphere below or the corona above nobody knows. Experts incline to the opinion they grow from above.

At the eclipse of 1842 astronomers failed to notice any motion in the red mountains during the few minutes they were visible. Probably the prominences they saw were

of the type called quiescent, which may go for weeks without appreciable change. When a prom happens to be near one of the poles we can watch it wheeling around day after day in a little circle, presenting first one side and then the other toward us, like a sail.

If you keep watch long enough, some day a prom instead of remaining placidly quiescent will suddenly show signs of life. It will grow violently agitated, arching upward and throwing off streamers to one side. Evidently a center of attraction has formed nearby. The prominence is leaning toward it farther and farther like a tree bending under a powerful wind. There—it has been uprooted! The whole prom is blowing up. Now coronals are appearing from outside space drawn irresistibly toward the center of attraction. The prominence looks as if it might be leaving the sun for good. It is nearly half a radius above the surface and still rising. But, no! The fragment is turning back. The center of attraction is pulling it down, down into depths of the chromosphere. Soon the last streamer has vanished beneath the surface. (Fig. 7.)

Not always is the center of attraction victorious. If the force from the center of attraction reaches a certain critical value the prominence rises and leaves the sun entirely. Proms may frequently be followed to elevations of several hundred thousand miles before fading away. Even at these prodigious heights they continue to send streamers back to the center of attraction. The solar altitude record is held by a prominence which went into eruption on March 20, 1938. It attained a height of 960,000 miles or 1.11 solar diameters before disappearing. This prominence was almost precisely at the north pole of the sun. The velocity record is held by the eruptive prominence of September 17, 1937, which was followed up to 620,000 miles when it was moving at the rate of 1,600,000 miles per hour. It might have established an altitude record, too, if it had not unfortunately moved outside the frame of the camera and thus automatically cut itself out of the picture and posterity.

Before 1936 our knowledge of prominences was based upon the early visual records and single photographs of exceptionally interesting objects. Motion in prominences could only be studied by taking a series of shots as fast as an astronomer could make an exposure and change plateholders, an operation which might require four or five minutes. Then motion picture technique was applied and what had often been conjecture and surmise was soon established as fact. The time scale could be speeded up by a "compression factor" of five hundred if necessary. Now the most stable quiescent prominences were seen swaying under the influence of powerful forces. But what kind of forces? Where do they originate? Above all, how do they act? These questions could only be answered by measures on sharply defined knots

and nuclei within the cloudlike mass.

Suppose that we have made a series of measures upon an eruptive prominence, from the time the upward motion was first detected until the cloud vanished two hours later. We plot the measured heights against time and start to draw a smooth curve through them. This turns out to be harder than we expected. No matter what degree of curvature we try the points refuse to fit. Looking closer we begin to see where the trouble lies. The points do not fall upon a smooth curve turning continuously upward. They fall upon a series of *straight lines.* (Fig. 8.)

What does this mean? It means that at the beginning of the eruption the material was ascending at the rate of, say, three miles per second. For an hour motion continued at this fixed rate within the errors of measurement. Then abruptly the speed changed to twelve miles per second, as if the prom had received a sudden impulse. After thirty minutes the speed jumped to forty-eight miles per second, and twenty minutes later to ninety-nine miles per second. Shortly afterward the cloud faded from sight.

This is a very curious way for a moving body to behave and deserves the closest scrutiny. Here are measures on four prominences for which the figures are exceptionally reliable.

TABLE I

Date	Velocity (Miles/sec.)	Multiples
May 29, 1919	3.4, 9.1, 17.3, 37.3	3, 2, 2
June 18, 1929	1.9, 11.8, 23.0	6, 2
Nov. 14, 1934	8.4, 24.9	3
Sept. 22, 1933	1.4, 20.2, 80.8	15, 4

If you will study these figures for a couple of minutes I believe you will notice a remarkable relationship among them. *Each succeeding velocity is almost an exact whole multiple of the one preceding it.* The astronomer who discovered this relationship has made a survey of all prominence material over a period of fifty years and finds that the great bulk follows the principle just stated. What is more, he finds the relationship holds regardless of whether the prominence material is moving up or down.

As one solar worker has expressed it, "To say that these curious laws of prominence motion are mysterious is very definitely an understatement. They contradict every known law of the motion of particles under the action of a gravitationally attracting center; it is as though acceleration in prominences functioned only in definite 'acceleration quanta.'"

Nature abhors a discontinuity. She likes to have bodies move along smoothly and not by leaps and jerks. Remember, too, that if the changes in velocity observed are really instantaneous it implies an infinite acceleration is acting.

Naturally everyone is not agreed upon these results. In particular, the conclusion that the change in velocity is always a whole multiple of the one preceding has been criticized, and there is evidence that streamers and knots descending into the chromosphere can be better represented by a curve than a straight line. Even the severest critics, however, admit that for ascending

prominences the measures favor the existence in many cases of sudden changes from one fixed speed to another.

IV.

He is bold indeed who advances a theory which pretends to explain all the anomalies of prominence motion. Yet several ingenious schemes have been put forward which account rather well for the main features of the motion. So far, however, no theory has won general acceptance.

Modern theories of prominences invariably start by invoking the aid of light pressure. If you can devise a theory that functions without light pressure, you will be doing pretty well. I shall merely sketch roughly the lines along which most theories are modeled without attempting to go into all the manifold details involved.

In the atmosphere of the earth the density should decrease upward with the heavy gases proportionally greater near the bottom and the lighter ones predominating higher up. We have plenty to learn yet about our own atmosphere but the observations so far as they go agree fairly well with theory, carbon dioxide, argon, and oxygen being more abundant near the surface, and nitrogen and helium farther up.

When we try the same theory on the atmosphere of the sun we have no success whatever. Although hydrogen and helium occur high in the chromosphere, the element that goes highest of all is calcium, of atomic weight 40. More precisely, we really mean ionized calcium which has lost one electron, or Ca II. The neutral calcium atom, Ca I, occurs much lower in the chromosphere.

Now how can an atom of atomic weight 40 soar to the very highest observable levels in the chromosphere? That was the $64 question astrophysicists were puzzling over a quarter of a century ago. The prize went to an English mathematician, E. A. Milne, who found an answer in light pressure.

He showed that there are two main reasons why the ionized calcium atom outscores all others when it comes to floating on a light beam in the chromosphere. First, ionized calcium is constructed in just the right way for easy riding on light rays of a particular color.* Second, the sun emits an abundance of these particular colored rays. As Professor Russell put it, "These are the rays which the atoms of one of the most abundant elements in the solar atmosphere absorb most powerfully, when in that state in which under solar conditions they are most likely to occur."

Perhaps we can make it a little plainer by drawing an analogy albeit rather strained between atoms supported in the chromosphere by light pressure and parachutists floating in the air.

As these men bail out we are struck by the curious insignia upon their uniforms and the miscella-

* *Two* particular colors, since Ca II produces a pair of spectrum lines just on the limit of visibility if you have a good violet eye.

neous lot of 'chutes with which they are equipped.

Men with an "O" upon their uniform are equipped with large parachutes which by no amount of tugging can be made to open properly, so that they catch very little air and send their passengers plummeting downward. These are oxygen atoms which absorb strongly only certain far ultraviolet rays which are very scarce in yellow sunlight. Hence, an oxygen atom very rarely receives an impulse upward from a light beam, which means that it can never rise high in the chromosphere.

Other men wearing an "Fe" have a long string of little parachutes which open properly but are of slight help in slowing their descent. Iron atoms are able to absorb a great many different rays from sunlight but not enough of any particular one to help much in boosting them upward.

Those marked "Na" have large parachutes which open properly and support them fairly well. The trouble here seems to be that they are so insecurely attached that every few minutes one rips loose, sending the unfortunate bearer hurtling below to join the "O's." Sodium atoms absorb powerfully in the yellow when *neutral*, enough to lift them to a moderate elevation. But they have an electron which is rather lightly bound so that sodium is in constant danger of being *ionized*. The instant sodium loses an electron it can absorb practically nothing from sunlight, causing it

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to drop from the chromosphere immediately. (Unless lucky enough to pick up another electron on the way down, of course.)

But look at those men wearing a big "Ca II" on their backs floating serenely above all the others, their huge parachutes opened wide to the breeze. Not only are these 'chutes finely made and securely attached, but the men themselves are experts at manipulating them so as to catch every breath of ascending air.

We can even envisage a process whereby a cloud of ionized calcium might get to moving so fast it would be blown clear out of the chromosphere. If a Ca II atom by a series of rapid impulses from light quanta acquired a considerable upward velocity, instead of having to absorb the same violet rays that the great mass of stationary Ca II's are gulping at the rate of 20,000 per second, it could absorb light of a deeper violet shade which is more abundant. This is the Doppler effect coming into action, although we are accustomed to thinking of it from the viewpoint of the observer rather than that of the atom. The atom being now exposed to light of greater strength than before is impelled outward with increasing speed. This enables it to absorb light still farther into the violet which in turn gives it still greater speed. Thus if we can once get an ionized calcium atom to moving outward in the first place, by its own absorption it could lift itself by the bootstraps until blown free from the sun. In our parachute analogy, we might think of the Ca II's as drifting above the others into a current of air which grew stronger with increasing altitude, until eventually they are wafted up into the stratosphere.

Milne seems to have startled himself by the consequences of his theory. "The sequence of events just described may seem at first slightly fantastic," he wrote in 1926, "but I can see nothing in it not solidly based on established physical principles. Once the atom has left home on the violet side, an increasing acceleration is inevitable. It must move faster and faster until supplies fail in virtue of the inverse square law cutting down the radiation. It finishes up as a high-speed atom moving with uniform velocity, gravitationally free from the parent star. The prodigal never returns."

The Milne effect gives a plausible explanation of how a prominence might go into eruption, the atoms receding faster and faster until they disperse into the corona and vanish. The chief objection is the fact that the prominence should on this basis move outward with a continuously increasing velocity. Whereas the observations show that the velocity is fixed for an interval, and then increases suddenly by some whole number of times. (Fig. 9.)

Another dilemma which we have purposely failed to mention is that of differential light pressure. A prominence consists mostly of hydrogen mixed throughout with ionized calcium. The appearance of

a quiescent prom is about the same whether photographed with the red line of hydrogen or the violet line of Ca II. Suppose the prominence begins to erupt and let us assume the outburst *is* due to light pressure. Now hydrogen and ionized calcium will be affected very differently by light pressure, so that within a very few minutes the two should begin to separate out. Hydrogen should forge ahead rapidly at first, leading calcium by 3700 miles at the end of eight minutes. But soon calcium begins to gain, reaching the 60,000 mile level after 21 minutes practically on even terms. From then on it is no contest. Calcium is 30,000 miles ahead at 26 minutes, and 68,000 miles at 29 minutes.

Therefore, simultaneous photographs of an eruptive prominence taken with hydrogen and calcium should soon reveal marked discrepancies due to differential light pressure. On the contrary, such photographs fail to show any significant differences. The observation is an easy one, from which there would seem to be no appeal.

Various attempts have been made to modify Milne's original theory by assuming that hot spots develop near a prominence which cause the velocity changes. The idea is not so farfetched as it sounds, for intensely bright areas called *flares* often occur on the sun. But they are seen exclusively over sunspots which are confined to a zone within 40° of the solar equator, whereas an eruptive prominence may happen anywhere, even at the poles.

V.

It is possible that recent developments may soon make our present picture of the chromosphere and corona look as outmoded as those of the last century, when the sun was endowed with a dense atmosphere overlying a molten solar sea.

Under the combined onslaught of the spectroscope and quantum mechanics this was slowly dissolved into a tenuous envelope composed of electrons, atoms, and a few tightly bound molecules. Many things became clear that long had been obscure. We discovered why the ionized atoms occur at great elevations in the chromosphere instead of near the bottom where the temperature is higher, why oxygen shows in the bright disk but disappears over spots, and why certain elements appear missing from the sun entirely. In fact, we had an explanation for nearly everything in the solar atmosphere except the origin of the coronal lines. After each coronal line under the column marked "Element" we could write only "?".

We all know how for years astronomers evaded the difficulty by the convenient assumption of the unknown element *coronium*. This assumption eventually became so forced that an article once appeared in the dignified British journal, *The Observatory*, suggesting that a more suitable name would be *bolonium*. When in 1927 the spectrum lines in the gaseous nebulae attributed to *nebulium* were identified with forbidden lines of

ionized oxygen and nitrogen, astrophysicists felt positive that the secret of the coronal lines was already in their possession if they could only find it. No clue was considered too farfetched, no supposition too wild, to be disregarded. Every possibility based upon normal, once, twice, and three times ionized atoms proved fruitless. Forbidden lines, Raman effects, and peculiar types of excitation were tried and found wanting. By 1940 we had considerable observational knowledge of the corona. Lyot, from his work upon the Pic du Midi, had been able to classify the coronal lines into three distinct groups. Coronal lines had been photographed in Nova RS Ophiuchi 1932. Yet still the origin of the coronal lines escaped us. It seemed as if we were confronted by a blank wall. There was literally nothing else to be tried.

This was the situation in 1942 when a few typewritten copies of a paper were circulated among astronomers in the United States entitled, "An Attempt to Identify the Emission Lines in the Spectrum of the Solar Corona." It contained implications so startling that experts were loathe to accept conclusions that upset all their well established notions. But as additional information filtered through the blockade, the list of identifications became too impressive to be thrust aside. Today we feel reasonably sure that the search for the coronal lines which has been conducted with increasing fervor for seventy years is finally ended.

Credit for the discovery goes to a Swedish spectroscopist, Bengt Edlén (pronounced ed LANE). When he lectured in Pasadena in 1938 I recall him as a modest unassuming young man whose age at that time I would estimate as twenty-seven. His voice was so low that often it fell almost to a whisper. He discussed various techniques for photographing spectrum lines in the extreme ultraviolet, a field in which he was already an authority.

There is a little story connected with the discovery of the coronal lines which is worth repeating, as it throws an interesting sidelight on one of the most important discoveries of our generation. I reproduce it here in nearly the same words it was told originally.

Like all spectroscopists, Edlén had been thinking of the coronal problem for many years. In 1934 he spent three months with a friend discussing all possibilities existing at that time, and later they started a joint investigation of the doubly ionized iron atom with the faint hope that it might lead to something, but without result. In 1939 the physicist, Groatrian, called Edlén's attention to two highly ionized lines of iron in the extreme ultraviolet which Edlén had observed himself, and suggested that they afforded a clue to the origin of two coronal lines in the red.

Groatrian's remark came when Edlén was preparing a report to be presented at the Paris conference on novae in 1939. Edlén at

once became deeply interested in this suggestion. He began an investigation of his unpublished material on spectrum lines of atoms ionized nine, ten, and eleven times —atoms such as no one had ever dared dream might exist in the corona. Almost from the start he achieved success, being able to predict lines of Fe XIII, Fe XIV, Ni XII, et cetera, and finding coincidences with coronal lines which looked so good they could hardly be the result of chance.

In June and July, 1939, Edlén and his friend discussed his list of identifications while on their way to the Paris conference. This meeting was attended by some of the most notable astrophysicists from Europe, England, and the United States. Edlén was questioned specifically upon the problem of coronal lines in novae. Yet even with this new knowledge already within his grasp he refused to mention his results, feeling that he should study the matter further before making an announcement. Not until two years later when he had worked out a detailed list of identifications did he feel justified in publishing a preliminary report in a Swedish Journal. In 1942 a complete account appeared, of which several typewritten copies managed to reach this country.

It should be made thoroughly clear that Edlén never produced any coronal lines in his laboratory. What he did was to predict from atomic theory the position and strength of certain lines of highly ionized iron, nickel, and calcium from his knowledge of the structure of these atoms. Similar predictions had been made before, and a number of times it looked as if the mystery was solved, only to find upon closer investigation it was merely another false alarm. This was the reason Edlén proceeded so cautiously, for although his first list of identifications looked very promising, owing to experimental difficulties they could not be considered conclusive. The decisive factor is this: that if we assume four lines in the corona to be correctly identified with lines of Fe X, Fe XI, Ca XII, and Ca XIII, *then an almost complete identification of the whole coronal spectrum can be consistently carried through.* At present only four coronal lines remain unidentified, two of them very weak.

Astrophysicists hesitated to accepted Edlén's results at first because they demand such outrageously high temperatures for a region which was supposed to be a few thousand degrees at the most. When doubly and trebly ionized atoms had been grudgingly admitted to the highly rarified atmosphere of the corona we had been stretching things to the limit. Now we were told the corona contained atoms ionized a dozen times! The temperature would have to be 1,000,000 K! We had always supposed the atoms in the corona must be badly shaken up but we never expected to find them blitzed beyond recognition.

After the experts had had time

to think it over for awhile, however, they decided that perhaps the situation was not so bad as they had originally feared. In fact, they have now practically convinced themselves that they knew it all the time. Look at the helium lines that we mentioned earlier. It was perfectly obvious they couldn't exist in the chromosphere unless some powerful source of energy was available to keep them shining. Besides, the kind of temperature we are talking about is not so much a measure of heat as a measure of the velocity of moving particles. A single atom out in the depths of space if moving fast enough might have a "kinetic" temperature of a million degrees.

Already the concept of a super-excited corona is beginning to pay off. We have discussed the long streamers or coronals revealed on motion pictures of the prominences which apparently issue from empty space into a center of attraction. Now the explanation seems fairly obvious. Among the mysteries of the corona has always been the absence of hydrogen lines from its spectrum. Apparently the temperature must be so high that neutral hydrogen cannot exist. The hydrogen atoms are all broken up into electrons and protons. The protons emit no light. Therefore, although a cloud of them may be present they will fail to register on the motion picture film. Here comes a stream of protons rushing toward a center of attraction. Approaching the surface they pick up electrons, are transformed back into neutral hydrogen atoms, and presto!—begin to emit the red line again. Of course, the instant they begin to emit we see them come into the picture.

Strange substitute for raindrops. Protons drawn from the corona condensing into flaming hydrogen!

How can the sun with a temperature rigorously measured by three different methods which agree at about 5900° K possibly produce effects corresponding to matter at a temperature of 1,000,000° K? Answers are already forthcoming. Because the coronal radiations arise from elements such as iron and nickel found abundantly in meteorites, a theory has been advanced that high speed meteorites raining in upon the sun may be the solution. Another theory has particles in the solar atmosphere accelerated to enormous speeds by electromotive forces. The East Indian physicist, Saha, who in 1920 at one stroke gave us a complete explanation of ionization in the chromosphere, has advanced an hypothesis based upon results observed when uranium nuclei are bombarded by neutrons. Highly ionized ironlike particles are ejected at terrific speeds corresponding to the atoms found in the corona by Edlén.

Edlén's identification of the coronal lines came so slowly and during such troubled times that his work has gone practically unnoticed except for a few comments in technical journals which have a struggle to keep their circulation

above a thousand.* The Japanese balloon bomb attracted far more attention. Probably many will say that after all this is as it should be. Now that the coronal lines are identified what can we do with them?

Certainly no one today would contend that the work of an electronic engineer is without practical benefit. Yet is an engineer testing the performance of a vacuum tube really so different from an astronomer charting the motion of a prominence? The engineer is studying the fine structure of matter within the world of the vacuum tube. The astronomer is studying the fine structure of matter above the surface of the nearest star.

Or is the engineer studying a tiny portion of the atmosphere of a star he has trapped in his laboratory, and the astronomer the interior of a vacuum tube magnified a million million times?

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VI.

For three-quarters of a century astronomers searched for the combination to a carefully guarded treasure, made all the more alluring by glimpses occasionally granted them of dazzling riches just beyond their grasp. For hidden only by an intangible wall of light is the solar corona, a treasury of strange atoms and photons awaiting exploration. When the combination was eventually found, astronomers marveled at its simplicity. It involved nothing with which they were not already thoroughly familiar. If you would like to know this combination, then read on. In the next fifteen minutes you can learn what some of the most brilliant scientists of three generations strove in vain to discover.

It would take too long to describe all the schemes to observe the corona without an eclipse that have been tried without success since the first serious attempt was made in 1878. Usually the bright image of the sun was caught on a blackened disk at the focus of the camera and the exposure made either with or without a color filter. At first only blue light was used, but after 1904 plates could be sensitized to the red and infrared rays.

In the course of time a great many plates were thus obtained by various observers working at high altitudes in a very clear atmosphere. No doubt many an enthusiastic coronagrapher's heart has leaped up when he beheld upon his negatives an irregular halo surrounding the sun resembling the corona. That these halos are due solely to diffused light and not the corona is easily proven. The exposures were much too short to register the corona. They do not show the prominences which are brighter than the corona. On photographs taken at partial eclipses the "corona" is spread onto the disk of the moon without even revealing its edge.

* As this was being written, word came that Edlén has been awarded the Gold Medal of the Royal Astronomical Society for 1945. This prize was awarded to Bernard Lyot in in 1939 for his invention of the coronagraph.

which should have been clearly marked by the coronal light.

Other observers put their faith in indirect methods. In 1893, Deslandres and later Hale, climbed to the top of Mount Etna where they tried to photograph the corona by isolating one of the broad dark lines of ionized calcium. Other methods equally unsuccessful were thermo-electric devices to detect the infrared radiation of the corona; the Savart polariscope; and the spectroscope to look for the green coronal line near the edge of the sun. These attempts were made by men of great skill, and as one after another went down to failure, the problem gradually came to be regarded as hopeless.

Therefore, in 1932 when a Frenchman named Bernard Lyot who was then practically unknown to astronomers, announced that he had photographed the corona without an eclipse his findings were received with considerable skepticism. Later results, however, showed without question that he had indeed penetrated the glare of scattered light which conceals the corona. He seems to have accomplished this feat largely by the unique system of taking infinite pains with a multitude of details.

Lyot set about his project in a very systematic way. First of all, he set up a single lens and placed an intense source of light before it having the same angular diameter as the sun. An image of the light formed by this lens was projected upon an opaque disk. Placing the eye behind the disk, the lens was seen to be surrounded by a brilliant halo due to diffraction around the edge of the lens. The halo was estimated at two hundred times the brightness of the corona, which alone was enough to render observations impossible. Plate 11, Fig. 1.

In addition, the lens was studded with bright points and lines caused by bubbles in the glass, dust particles, scratches, and veins within the lens itself. Another source of glare was a bright spot produced by internal reflection from the two faces of the lens.

How could these sources of diffused light be eliminated or reduced in brightness? Here is the way Lyot proceeded.

The plan of the coronagraph in its simplest form is shown in Plate 11, Fig. 2. The chief lens at A forms an image on a blackened brass disk at B, which projects beyond the margin by a small amount. This disk is tilted slightly in the real coronagraph so that the light falling upon it is reflected up through windows at the top of the tube, to prevent heating. (Not shown in the diagram).

The lens itself must naturally be as nearly perfect as the optician can make it. The lens now employed in Lyot's coronagraph after five years of experimentation was ground at the Paris Observatory from a disk of borosilicate crown glass, figured and polished with the greatest care without scratch or bubble. It is plano-convex, with a diameter of 7.9 inches (20 cm) and a focal length of 157.5 inches (4 meters).

Although Lyot doesn't mention it in any of his articles that I have read, he surely must make use of a new method for reducing diffused light by coating a lens with a thin film of calcium or lithium fluoride. That the transmission of a lens can be improved by coating it with something sounds directly contrary to ordinary experience. But in this case the film acts in an entirely different way from the dust and thumbprints that usually spoil the performance of a lens. By evaporating metallic films onto the lens in a high vacuum, and by making the thickness of the film about four millionths of an inch, a beam of light striking the lens and film surfaces instead of being partially *reflected,* is almost one hundred percent *transmitted.* The method is not really new but was accidentally discovered a century ago. Those intensely black spots that develop on soap bubbles are due to this principle.

Now comes one of the most interesting features of the coronagraph by means of which the bright halo surrounding the lens is eliminated.

Close behind the disk B was set a field lens which forms an image of the lens A on the diaphragm at D. The edge of the diaphragm is set just right so as to cut off the ring of light diffracted around A. It might be supposed that this field lens would interfere with the light of the corona. But by making the field lens thin and putting it close to the focus of A, the coronal light is not appreciably distorted. And now the strong halo around the chief lens instead of being superimposed upon the corona has been neatly removed from the beam where it will do no harm.

The internal reflection from the two faces of the lens A produces a little bright spot near D. This was caught on a tiny diaphragm set at the center of the opening there.

Behind the diaphragm, carefully protected from stray light, a strongly corrected camera lens E forms an achromatic image of the corona on the photographic plate.

The whole apparatus is contained within a tube F, opened only during observations, and coated with thick oil to collect dust particles.

But regardless of how expertly the coronagraph was made, it would never be able to reveal the corona unless used under a perfect sky. Hence, the next step was to determine the best possible site for the instrument.

Lyot noticed from observations made in the mountains, that when dust particles carried upward by rising currents of air meet a warmer layer, the particles spread out forming a brown horizontal sheet. The dust rises higher during fine weather and decreases during rains and snows. Also, the layer is higher during summer than winter and greater toward the equator than toward the poles. In France the highest level attained by the dust was between 7500 and 9000 feet. Considerations such as these induced him to install his apparatus upon the Pic du Midi, a peak that towers to an elevation of 9400 feet in the

Pyrenees mountains of southern France.

From several points of view the Pic du Midi is ideally suited for study of the solar corona, not the least of which was the fact that an observatory dome had already been erected upon it. This dome housed a firmly mounted equatorial telescope upon which heavy apparatus could be fixed. (I might mention here that astronomers seldom bother to look through refractors any more, but merely use the mounting as a sort of Christmas tree upon which to hang their photometers, cameras, spectrographs, et cetera, et cetera). The sky was known to be wonderfully transparent especially at the end of spring and beginning of summer. There were living quarters for astronomers provided with central heating, running water, and electricity. A road extended to 8450 feet but was open only during August and September. Plate 12, Fig. 3.

The public is inclined to picture astronomers as pale aesthetes nourished upon moonbeams and stardust. If they could see the astronomers toiling up the trail to the Pic du Midi, they would change their ideas in a hurry.

The instruments could be transported by mules over the road up to 3600 feet. Here the carriers abandoned the road to follow a higher valley leading to the foot of the Pic du Midi. Plate 12, Fig. 4. Now the carriers had to unpack the mules and transport the equipment the rest of the way on their backs. At the 5800 foot level they reach a valley in which it is necessary to take to skis. Plate 12, Fig. 5. And at 8100 feet the final climb to the summit is made along a ridge, in some places so hazardous that it is necessary to cling to an iron cable. According to Lyot, "the ascent takes seven to ten hours, according to the state of the snow." The virile astronomers of the Pic du Midi may be able to make it in that time, but I can think of some others who would take a lot longer, including one not so far from home.

The first primitive coronagraph was built at the Pic du Midi out of planks found on the spot, and fixed upon the equatorial on July 25, 1930. With this crude instrument the prominences could be seen as violet-pink clouds, and the contrast could be considerably increased with a red filter. The corona, however, stubbornly remained hidden from view. On July 30th, when apparently the sky became more transparent, a direct vision spectroscope showed among the familiar solar lines due to ordinary diffused sunlight, the bright green line of the corona!

A year later Lyot again ascended the Pic du Midi with more elaborate apparatus which he used in an endeavor to eliminate the various "bugs" always present in experimental work. With the approach of sunspot minimum in 1932 he decided to cease observations temporarily, as the coronal lines were growing very faint, and he felt his time could be more profitably employed in the design of new

equipment. He had in mind a more powerful coronagraph than the earlier one, with a spectrograph that was easier to manage, free from flexure, and very fast in the infrared.

The coronagraph as finally set up about 1935 is shown in Plate 13, Fig. 8, attached to the axis of the equatorial telescope.

The coronagraph A is mounted on two ball-bearing pedestals, B and C, which allow it to be turned on its axis. The chief lens at D is the one previously described, a plano-convex 7.9 inches in diameter and 157.5 inches focal length. The lens is held in its cell by a groove and can be taken out to be cleaned by a handle. Also shown are the spectrograph E, within which is mounted a lens on the frameholder F, and the camera where the photographic plate is inserted at G. The tube of duralumin is twenty feet long and weighs only forty-eight pounds.

Lyot states that when the sky is exceptionally clear, by using a low power eyepiece and an orange filter, it is actually possible to see the inner or brighter corona directly with the eye. Usually, however, the coronal streamers are too weak to be observed visually, but may be readily photographed with a red filter on a contrasty panchromatic plate. Plate 14, Figs. 9-17, shows photographs of the corona taken without an eclipse reproduced in actual size.

With his spectrograph, Lyot explored the corona from wave length 3330 A in the ultraviolet to the limit of photographic sensitivity in the infrared at 12,000 A. To accomplish this feat he was forced to use seven different kinds of plates and exposures ranging from ten minutes in visual light to four hours in the infrared.

Plate 15, Figs. 18-21, shows photographs of the spectrum of the chromosphere and corona from the limit of the ultraviolet to about the limit of visible red light. The spectrum lines are curved instead of straight because a curved slit was used having about the same curvature as the solar image, thus showing the distribution of brightness around the edge of the sun. The spectrum photographs in Figs. 22-31 are mostly of coronal lines.

A puzzling feature about Lyot's photographs of the coronal lines

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taken near sunspot maximum in 1938 was the extraordinary width of the rays. Spectrum lines produced by atoms in the corona where the temperature is presumably low should have been sharp and fine. Yet these appeared quite broad as if the atoms were moving with high velocity. Now this result is beautifully explained by Eldén's work, which as we have seen makes the temperature of the corona about 1,000,000° K.

One more observation with the coronagraph, although of minor importance, is somehow to me the most fascinating of all. It is an uncanny example of unseen worlds revealed by man's ingenuity.

A transit of Mercury across the disk of the sun is always a noteworthy event. The last transit occurred on November 11, 1940, which was widely observed in the United States, as the transits furnish a means of checking the uniformity of the earth's rotation.

But on May 11, 1937 Lyot witnessed a transit of Mercury—not against the disk of the sun in the usual way—but against the background of the corona. At one time Mercury passed in front of a prominence. He was able to follow the planet both visually and photographically, securing sixteen plates in all. On these photographs not a single line or point of light appears on the edge of the disk of Mercury. From which Lyot concluded that the atmosphere of Mercury diffuses light very feebly, and that on the surface of the planet the bending of the sun's rays by the atmosphere would be less than one-thirtieth of that on the earth.

Although the coronagraph is a huge stride forward, yet it can hardly replace eclipse expeditions entirely. The earth's atmosphere still looms as a formidable barrier which at the best can only be partially surmounted by improvements in observational technique.

To achieve complete success we must rise above the atmosphere by rocket possibly to an altitude of one hundred miles. At all costs we must penetrate the ozone layer which completely cuts out the most interesting part of the solar spectrum in the deep ultraviolet. Probably the most valuable single contribution that could be made to astrophysics today would be a photograph showing the spectrum lines at present hidden from us by the ozone bands.

THE END.

What You Need

by LEWIS PADGETT

What you need may turn out to be a pair of scissors, or a hen's egg, or any of a number of remarkably uninteresting things—till you find why you need it more than anything else on Earth!

Illustrated by Williams

WE HAVE WHAT YOU NEED

That's what the sign said. Tim Carmichael, who worked for a trade paper that specialized in economics, and eked out a meager salary by selling sensational and untrue articles to the tabloids, failed to sense a story in the reversed sign. He thought it was a cheap publicity gag, something one seldom encounters on Park Avenue, where the shop fronts are noted for their classic dignity. And he was irritated.

He growled silently, walked on,

then suddenly turned and came back. He wasn't quite strong enough to resist the temptation to unscramble the sentence, though his annoyance grew. He stood before the window, staring up, and said to himself, "We Have What You Need. Yeah?"

The sign was in prim, small letters on a black painted ribbon that stretched across a narrow glass pane. Below it was one of those curved, invisible-glass windows. Through the window Carmichael could see an expanse of white velvet, with a few objects carefully arranged there. A rusty nail, a snowshoe, and a diamond tiara. It looked like a Dali decor for Cartier's or Tiffany.

"Jewelers?" Carmichael asked silently. "But why *what you need?*" He pictured millionaires miserably despondent for lack of a matched pearl necklace, heiresses weeping inconsolably because they needed a few star sapphires. The principle of luxury merchandising was to deal with the whipped cream of supply and demand; few people needed diamonds. They merely wanted them and could afford them.

"Or the place might sell jinni-flasks," Carmichael decided. "Or magic wands. Same principle as a Coney carny, though. A sucker trap. Bill the Whatzit outside and people will pay their dimes and flock in. For two cents—"

He was dyspeptic this morning, and generally disliked the world. Prospect of a scapegoat was attractive, and his press card gave him a certain advantage. He opened the door and walked into the shop.

It was Park Avenue, all right. There were no showcases or counters. It might be an art gallery, for a few good oils were displayed on the walls. An air of overpowering luxury, with the bleakness of an unlived-in place, struck Carmichael.

Through a curtain at the back came a very tall man with carefully-combed white hair, a ruddy, healthy face, and sharp blue eyes. He might have been sixty. He wore expensive but careless tweeds, which somehow jarred with the decor.

"Good morning," the man said, with a quick glance at Carmichael's clothes. He seemed slightly surprised. "May I help you?"

"Maybe." Carmichael introduced himself and showed his press card.

"Oh? My name is Talley. Peter Talley."

"I saw your sign."

"Oh?"

"Our paper is always on the lookout for possible write-ups. I've never noticed your shop before—"

"I've been here for years," Talley said.

"This is an art gallery?"

"Well—no."

The door opened. A florid man came in and greeted Talley cordially. Carmichael, recognizing the client, felt his opinion of the shop swing rapidly upward. The florid man was a Name—a big one.

"It's a bit early, Mr. Talley," he said. "but I didn't want to delay. Have you had time to get . . . what I needed?"

"Oh, yes. I have it. One mo-

ment." Talley hurried through the draperies and returned with a small, neatly-wrapped parcel which he gave to the florid man. The latter forked over a check—Carmichael caught a glimpse of the amount and gulped—and departed. His town car was at the curb outside.

Carmichael moved toward the door where he could watch. The florid man seemed anxious. His chauffeur waited stolidly as the parcel was unwrapped with hurried fingers.

"I'm not sure I'd want publicity, Mr. Carmichael," Talley said. "I've a select clientele—carefully chosen."

"Perhaps our weekly economic bulletins might interest you—"

Talley tried not to laugh. "Oh, I don't think so. It really isn't in my line."

The florid man had finally unwrapped the parcel and taken out an egg. As far as Carmichael could see from his post near the door, it was merely an ordinary egg. But its possessor regarded it almost with awe. Had Earth's last hen died ten years before, he could have been no more pleased. Something like deep relief showed on the Florida-tanned face.

He said something to the chauffeur, and the car rolled smoothly forward and was gone.

"Are you in the dairy business?" Carmichael asked abruptly.

"No."

"Do you mind telling me what your business is?"

"I'm afraid I do, rather," Talley said.

Carmichael was beginning to scent a story. "Of course I could find out through the Better Business Bureau—"

"You couldn't."

"No? They might be interested in knowing why an egg is worth five thousand dollars to one of your customers."

Talley said, "My clientele is so small I must charge high fees. You . . . ah . . . know that a Chinese mandarin has been known to pay thousands of *taels* for eggs of proved antiquity."

"That guy wasn't a Chinese mandarin," Carmichael said.

"Oh, well. As I say, I don't welcome publicity—"

"I think you do. I was in the advertising game for a while. Spelling your sign backwards is an obvious baited hook."

"Then you're no psychologist," Talley said. "It's just that I can afford to indulge my whims. For five years I looked at that window every day and read the sign backward—from inside my shop. It annoyed me. You know how a word will begin to look funny if you keep staring on it? Any word. It turns into something in no human tongue. Well, I discovered I was getting a neurosis about that sign. It makes no sense backwards, but I kept finding myself trying to read sense into it. When I started to say 'Deen uoy tahw evah ew' to myself and looking for philological derivations, I called in a sign painter. People who are interested enough still drop in."

"Not many," Carmichael said

shrewdly. "This is Park Avenue. And you've got the place fixed up too expensively. Nobody in the low-income brackets—or the middle brackets—would come in here. So you run an upper-bracket business."

"Well," Talley said, "yes, I do."

"And you won't tell me what it is?"

"I'd rather not."

"I can find out, you know. It might be dope, pornography, high-class fencing—"

"Very likely," Mr. Talley said smoothly. "I buy stolen jewels, conceal them in eggs, and sell them to my customers. Or perhaps that egg was loaded with microscopic French postcards. Good morning, Mr. Carmichael."

"Good morning," Carmichael said, and went out. He was overdue at the office, but annoyance was the stronger motivation. He played sleuth for a while, keeping an eye on Talley's shop, and the results were thoroughly satisfactory—to a certain extent. He learned everything but why.

Late in the afternoon, he sought out Mr. Talley again.

"Wait a minute," he said, at sight of the proprietor's discouraging face. "For all you know, I may be a customer."

Talley laughed.

"Well, why not?" Carmichael compressed his lips. "How do you know the size of my bank account? Or, maybe you've got a restricted clientele?"

"No. But—"

Carmichael said quickly. "I've been doing some investigating. I've been noticing your customers. In fact, following them. And finding out what they buy from you."

Talley's face changed. "Indeed?"

"In-*deed*. They're all in a hurry to unwrap their little bundles. So that gave me my chance to find out. I missed a few, but—I saw enough to apply a couple of rules of logic, Mr. Talley. *Item*, your customers don't know what they're buying from you. It's a sort of grab bag. A couple of times they were plenty surprised. The man who opened his parcel and found an old newspaper clipping. What about the sunglasses? And the revolver? Probably illegal, by the way—no license. And the diamond—it must have been paste, it was so big."

"M-mm," Mr. Talley said.

"I'm no smart apple, but I can smell a screwy set-up. Most of your clients are big shots, in one way or another. And why didn't any of 'em pay you, like the first man—the guy who came in when I was here this morning."

"It's chiefly a credit business," Talley said. "I've my ethics. I have to—for my own conscience. It's responsibility. You see, I sell . . . my goods . . . with a guarantee. Payment is made only if the product proves satisfactory."

"So. An egg. Sunglasses. A pair of asbestos gloves—I think they were. A newspaper clipping. A gun and a diamond. How do you take inventory?"

Talley said nothing.

Carmichael grinned. "You've an errand boy. You send him out and

he comes back with bundles. Maybe he goes to a grocery on Madison and buys an egg. Or a pawnshop on Sixth for a revolver. Or—well, anyhow, I told you I'd find out what your business is."

"And have you?" Talley asked.

"'We have what you need,'" Carmichael said. "But how do you *know?*"

"You're jumping to conclusions."

"I've got a headache—I didn't have sunglasses!—and I don't believe in magic. Listen, Mr. Talley. I'm fed up to the eyebrows and 'way beyond on queer little shops that sell peculiar things. I know too much about 'em—I've written about 'em. A guy walks along the street and sees a funny sort of store and the proprietor won't serve him—he sells only to pixies—or else he *does* sell him a magic charm with a double edge. Well—*pfui!*"

"Mph," Talley said.

"'Mph' as much as you like. But you can't get away from logic. Either you've got a sound, sensible racket here, or else it's one of those funny magic-shops set-ups—and I don't believe that. For it isn't logical."

"Why not?"

"Because of economics," Carmichael said flatly. "Grant the idea that you've got certain mysterious powers—let's say you can make telepathic gadgets. All right. Why the devil would you start a business so you could sell the gadgets so you could make money so you could live? You'd simply put on one of your gadgets, read a stockbroker's mind, and buy the right stocks. That's the intrinsic fallacy in these crazy-shop things—if you've got enough stuff on the ball to be able to stock and run such a shop, you wouldn't need a business in the first place. Why go round Robin Hood's barn?"

Talley said nothing.

Carmichael smiled crookedly. "'I often wonder what the vintners buy one half so precious as the stuff they sell,'" he quoted. "Well—what do *you* buy? I know what you sell—eggs and sunglasses."

"You're an inquisitive man, Mr. Carmichael," Talley murmured. "Has it ever occurred to you that this is none of your business?"

"I may be a customer," Carmichael repeated. "How about that?"

Talley's cool blue eyes were intent. A new light dawned in them; Talley pursed his lips and scowled. "I hadn't thought of that," he admitted. "You might be. Under the circumstances. Will you excuse me for a moment?"

"Sure," Carmichael said. Talley went through the curtains.

Outside, traffic drifted idly along Park. As the sun slid down beyond the Hudson, the street lay in a blue shadow that crept imperceptibly up the barricades of the buildings. Carmichael stared at the sign—"We have what you need"—and smiled.

In a back room, Talley put his eye to a binocular plate and moved a calibrated dial. He did this several times. Then, biting his lip—for he was a gentle man—he called his errand boy and gave him direc-

tions. After that he returned to Carmichael.

"You're a customer," he said. "Under certain conditions."

"The condition of my bank account, you mean?"

"No," Talley said. "I'll give you reduced rates. Understand one thing. I really do have what you need. You don't *know* what you need, but I know. And as it happens—well, I'll sell you what you need for, let's say, five dollars."

Carmichael reached for his wallet. Talley held up a hand.

"Pay me after you're satisfied. And the money's the nominal part of the fee. There's another part. If you're satisfied, I want you to promise that you'll never come near this shop again and never mention it to anyone."

"I see," Carmichael said slowly. His theories had changed slightly.

"It won't be long before . . . ah, here he is now." A buzzing from the back indicated the return of the errand boy. Talley said "Excuse me," and vanished. Soon he returned with a neatly-wrapped parcel, which he thrust into Carmichael's hands.

"Keep this on your person," Talley said. "Good afternoon."

Carmichael nodded, pocketed the parcel, and went out. Feeling affluent, he hailed a taxi and went to a cocktail bar he knew. There, in the dim light of a booth, he unwrapped the bundle.

Protection money, he decided. Talley was paying him off to keep his mouth shut about the racket, whatever it was. O.K. live and let live. How much would be—

Ten thousand? Fifty thousand? How big was the racket?

He opened an oblong cardboard box. Within, nesting upon tissue paper, was a pair of shears, the blades protected by a sheath of folded, glued cardboard.

Carmichael said something softly. He drank his highball and ordered another, but left it untasted. Glancing at his wrist watch, he decided that the Park Avenue shop would be closed by now and Mr. Peter Talley gone.

"'One half so precious as the stuff they sell,'" Carmichael said. "Maybe it's the scissors of Atropos. Blah." He unsheathed the blades and snipped experimentally at the air. Nothing happened. Slightly crimson around the cheekbones, Carmichael reholstered the shears and dropped them into the side pocket of his topcoat. Quite a gag!

He decided to call on Peter Talley tomorrow.

Meanwhile, what? He remembered he had a dinner date with one of the girls at the office, and hastily paid his bill and left. The streets were darkening, and a cold wind blew southward from the Park. Carmichael wound his scarf tighter around his throat and made gestures toward passing taxis.

He was considerably annoyed.

Half an hour later a thin man with sad eyes—Jerry Worth, one of the copy-writers from his office—greeted him at the bar where Carmichael was killing time. "Waiting for Betsy?", Worth said, nodding

toward the restaurant annex. "She sent me to tell you she couldn't make it. A rush deadline. Apologies and stuff. Where were you today? Things got gummed up a bit. Have a drink with me."

They worked on rye. Carmichael was already slightly stiff. The dull crimson around his cheekbones had deepened, and his frown had become set. "What you need," he remarked. "Double-crossing little—"

"Huh?" Worth said.

"Nothing. Drink up. I've just decided to get a guy in trouble. If I can."

"You almost got in trouble yourself today. That trend analysis of ores—"

"Eggs. Sunglasses!"

"I got you out of a jam—"

"Shut up," Carmichael said and ordered another round. Every time he felt the weight of the shears in his pocket he found his lips moving.

Five shots later Worth said plaintively, "I don't mind doing good deeds but I do like to mention them. And you won't let me. All I want is a little gratitude."

"All right, mention them," Carmichael said. "Brag your head off. Who cares?"

Worth showed satisfaction. "That ore analysis—it was that. You weren't at the office today, but I caught it. I checked with our records and you had Trans-Steel all wrong. If I hadn't altered the figures, it would have gone down to the printer—"

"What?"

"The Trans-Steel. They—"

"Oh, you fool," Carmichael groaned. "I know it didn't check with the office figures. I meant to put in a notice to have them changed. I got my dope from the source. Why don't you mind your own business?"

Worth blinked. "I was trying to help."

"It would have been good for a five-buck raise," Carmichael said. "After all the research I did to uncover the real dope—listen. Has the stuff gone to bed yet?"

"I dunno. Maybe not. Croft was still checking the copy—"

"O.K.!" Carmichael said. "Next time—" He jerked at his scarf, jumped off the stool, and headed for the door, trailed by the protesting Worth. Ten minutes later he was at the office, listening to Croft's bland explanation that the copy had already been dispatched to the printer.

"Does it matter? Was there . . . incidentally, where were you today?"

"Dancing on the rainbow," Carmichael snapped, and departed. He had switched over from rye to whiskey sours, and the cold night air naturally did not sober him. Swaying slightly, watching the sidewalk move a little as he blinked at it, he stood on the curb and pondered.

"I'm sorry, Tim," Worth said. "It's too late now, though. There won't be any trouble. You've got a right to go by our office records."

"Stop me now," Carmichael said. "Lousy little—" He was angry and drunk. On impulse he got another

taxi and sped to the printers, still trailing a somewhat confused Jerry Worth.

There was rhythmic thunder in the building. The swift movement of the taxi had given Carmichael a slight nausea; his head ached, and alcohol was in solution in his blood. The hot, inky air was unpleasant. The great Linotypes thumped and growled. Men were moving about. It was all slightly nightmarish, and Carmichael doggedly hunched his shoulders and lurched on until something jerked him back and began to strangle him.

Worth started yelling. His face showed drunken terror. He made ineffectual gestures.

But this was all part of the nightmare. Carmichael saw what had happened. The ends of his scarf had caught in moving gears somewhere and he was being drawn in-

exorably into meshing metal cogs. Men were running. The clanking, thumping, rolling sounds were deafening. He pulled at the scarf.

Worth screamed, ". . . knife! Cut it—"

The warping of relative values that intoxication gives saved Carmichael. Sober, he would have been helpless with panic. As it was, each thought was hard to capture, but clear and lucid when he finally got it. He remembered the shears, and he put his hand in his pocket—the blades slipped out of their cardboard sheath—and he snipped through the scarf with fumbling, hasty movements.

The white silk disappeared. Carmichael fingered the ragged edge at his throat and smiled stiffly.

Mr. Peter Talley had been hoping that Carmichael would not come back. The probability lines had shown two possible variants; in one, all was well; in the other—

Carmichael walked into the shop the next morning and held out a five-dollar bill. Talley took it.

"Thank you. But you could have mailed me a check."

"I could have. Only that wouldn't have told me what I wanted to know."

"No," Talley said, and sighed. "You've decided, haven't you?"

"Do you blame me?" Carmichael asked. "Last night—do you know what happened?"

"Yes."

"How?"

"I might as well tell you," Talley said. "You'd find out anyway. That's certain, anyhow."

Carmichael sat down, lit a cigarette, and nodded. "Logic. You couldn't have arranged that little accident, by any manner of means. Betsy Hoag decided to break our date early yesterday morning. Before I saw you. That was the beginning of the chain of incidents that led up to the accident. Ergo, you must have known what was going to happen."

"I did know."

"Prescience?"

"Mechanical. I saw that you would be crushed in the machine—"

"Which implies an alterable future."

"Certainly," Talley said, his shoulders slumping. "There are innumerable possible variants to the future. Different lines of probability. All depending on the outcome of various crises as they arise. I happen to be skilled in certain branches of electronics. Some years ago, almost by accident, I stumbled on the principle of seeing the future."

"How?"

"Chiefly it involves a personal focus on the individual. The moment you enter this place"—he gestured—"you're in the beam of my scanner. In my back room I have the machine itself. By turning a caliberated dial, I check the possible futures. Sometimes there are many. Sometimes only a few. As though at times certain stations weren't broadcasting. I look into my scanner and see what you need—and supply it."

Carmichael let smoke drift from

his nostrils. He watched the blue coils through narrowed eyes.

"You follow a man's whole life —in triplicate or quadruplicate or whatever?"

"No," Talley said. "I've got my device focused so it's sensitive to crisis curves. When those occur, I follow them farther and see what probability paths involve the man's safe and happy survival."

"The sunglasses, the egg and the gloves—"

Talley said, "Mr. . . . uh . . . Smith is one of my regular clients. Whenever he passes a crisis successfully, with my aid, he comes back for another checkup. I locate his next crisis and supply him with what he needs to meet it. I gave him the asbestos gloves. In about a month, a situation will arise where he must—under the circumstances —moves a red-hot bar of metal. He's an artist. His hands—"

"I see. So it isn't always saving a man's life."

"Of course not," Talley said. "Life isn't the only vital factor. An apparently minor crisis may lead to —well, a divorce, a neurosis, a wrong decision, and the loss of hundreds of lives indirectly. I insure life, health, and happiness."

"You're an altruist. Only why doesn't the world storm your doors? Why limit your trade to a few?"

"I haven't got the time or the equipment."

"More machines could be built."

"Well," Talley said, "most of my customers are wealthy. I must live."

"You could read tomorrow's stock-market reports if you wanted dough," Carmichael said. "We get back to that old question. If a guy has miraculous powers, why is he satisfied to run a hole-in-the-wall store?"

"Economic reasons. I . . . ah . . . . I'm averse to gambling."

"It wouldn't be gambling," Carmichael pointed out. "'I often wonder what the vintners buy—' Just what *do* you get out of this?"

"Satisfaction," Talley said. "Call it that."

But Carmichael wasn't satisfied. His mind veered from the question and turned to the possibilities. Insurance, eh? Life, health, and happiness.

"What about me? Won't there be another crisis in my life sometime?"

"Probably. Not necessarily one involving personal danger."

"Then I'm a permanent customer."

"I . . . don't—"

"Listen," Carmichael said, "I'm not trying to shake you down. I'll pay. I'll pay plenty. I'm not rich, but I know exactly what a service like this would be worth to me. No worries—"

"It wouldn't be—"

"Oh, come off it. I'm not a blackmailer or anything. I'm not threatening you with publicity, if that's what you're afraid of. I'm an ordinary guy. Not a melodramatic villain. Do I look dangerous? What are you afraid of?"

"You're an ordinary guy, yes," Talley admitted. "Only—"

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"Why not?" Carmichael argued. "I won't bother you. I passed one crisis successfully, with your help. There'll be another one due sometime. Give me what I need for that. Charge me anything you like. I'll get the dough somehow. Borrow it if necessary. I won't disturb you at all. All I ask is that you let me come in whenever I've passed a crisis, and get ammunition for the next one. What's wrong with that?"

"Nothing," Talley said soberly.

"Well, then. I'm an ordinary guy. There's a girl—it's Betsy Hoag. I want to marry her. Settle down somewhere in the country, raise kids, and have security. There's nothing wrong with that either, is there?"

Talley said, "It was too late the moment you entered this shop today."

Carmichael looked up. "Why?" he asked sharply.

A buzzer rang in the back. Talley went through the curtains and came back almost immediately with a wrapped parcel. He gave it to Carmichael.

Carmichael smiled. "Thanks," he said. "Thanks a lot. Do you have any idea when my next crisis will come?"

"In a week."

"Mind if I—" Carmichael was unwrapping the package. He took out a pair of plastic-soled shoes and looked at Talley, bewildered.

"Like that, eh? I'll need—shoes?"

"Yes."

"I suppose—" Carmichael hesitated. "I guess you wouldn't tell me why?"

"No, I won't do that. But be sure to wear them whenever you go out."

"Don't worry about that. And—I'll mail you a check. It may take me a few days to scrape up the dough, but I'll do it. How much—?"

"Five hundred dollars."

"I'll mail a check today."

"I prefer not to accept a fee until the client has been satisfied," Talley said. He had grown more reserved, his blue eyes cool and withdrawn.

"Suit yourself," Carmichael said. "I'm going out and celebrate. You—don't drink?"

"I can't leave the shop."

"Well, good-by. And thanks again. I won't be any trouble to you, you know. I promise that!" He turned away.

Looking after him, Talley smiled a wry, unhappy smile. He did not answer Carmichael's good-by. Not then.

When the door had closed behind him, Talley turned to the back of his shop and went through the door where the scanner was.

The lapse of ten years can cover a multitude of changes. A man with the possibility of tremendous power almost within his grasp can alter, in that time, from a man who will not reach for it to a man who will—and moral values be damned.

The change did not come quickly to Carmichael. It speaks well for his integrity that it took ten years

to work such an alteration in all he had been taught. On the day he first went into Talley's shop there was little evil in him. But the temptation grew stronger week by week, visit by visit. Talley, for reasons of his own, was content to sit idly by, waiting for customers, smothering the inconceivable potentialities of his machine under a blanket of trivial functions. But Carmichael was not content.

It took him ten years to reach the day, but the day came at last.

Talley sat in the inner room, his back to the door. He was slumped low in an ancient rocker, facing the machine. It had changed little in the space of a decade. It still covered most of two walls, and the eyepiece of its scanner glittered under amber fluorescents.

Carmichael looked covetously at the eyepiece. It was window and doorway to a power beyond any man's dreams. Wealth beyond imagining lay just within that tiny opening. The rights over the life and death of every man alive. And nothing between that fabulous future and himself except the man who sat looking at the machine.

Talley did not seem to hear the careful footsteps or the creak of the door behind him. He did not stir as Carmichael lifted the gun slowly. One might think that he never guessed what was coming, or why, or from whom, as Carmichael shot him through the head.

Talley sighed and shivered a little, and twisted the scanner dial. It was not the first time that the eyepiece had shown him his own lifeless body, glimpsed down some vista of probability, but he never saw the slumping of that familiar figure without feeling a breath of indescribable coolness blow backward upon him out of the future.

He straightened from the eyepiece and sat back in his chair, looking thoughtfully at a pair of rough-soled shoes lying beside him on a table. He sat quietly for awhile, his eyes upon the shoes, his mind following Carmichael down the street and into the evening, and the morrow, and on toward that coming crisis which would depend on his secure footing on a subway platform as a train thundered by the place where Carmichael would be standing one day next week.

Talley had sent his messenger boy out this time for two pairs of shoes. He had hesitated long, an hour ago, between the rough-soled pair and the smooth. For Talley was a humane man, and there were many times when his job was distasteful to him. But in the end, this time, it had been the smooth-soled pair he had wrapped for Carmichael.

Now he sighed and bent to the scanner again, twisting the dial to bring into view a scene he had watched before.

Carmichael, standing on a crowded subway platform, glittering with oily wetness from some overflow. Carmichael, in the slick-soled shoes Talley had chosen for him. A commotion in the crowd, a surge toward the platform edge. Carmichael's feet slipping frantically as the train roared by.

"Good-by, Mr. Carmichael," Talley murmured. It was the farewell he had not spoken when Carmichael left the shop. He spoke it regretfully, and the regret was for the Carmichael of today, who did not yet deserve that end. He was not now a melodramatic villain whose death one could watch unmoved. But the Tim Carmichael of today had atonement to make for the Carmichael of ten years ahead, and the payment must be exacted.

It is not a good thing to have the power of life and death over one's fellow humans. Peter Talley knew it was not a good thing—but the power had been put into his hands. He had not sought it. It seemed to him that the machine had grown almost by accident to its tremendous completion under his trained fingers and trained mind.

At first it had puzzled him. How ought such a device to be used? What dangers, what terrible potentialities, lay in that Eye that could see through the veil of tomorrow? His was the responsibility, and it had weighed heavily upon him until the answer came. And after he knew the answer—well, the weight was heavier still. For Talley was a mild man.

He could not have told anyone the real reason why he was a shopkeeper. Satisfaction, he had said to Carmichael. And sometimes, indeed, there was deep satisfaction. But at other times—at times like this—there was only dismay and humility. Especially humility.

We have what you need. Only Talley knew that message was not for the individuals who came to his shop. The pronoun was plural, not singular. It was a message for the world—the world whose future was being carefully, lovingly reshaped under Peter Talley's guidance.

The main line of the future was not easy to alter. The future is a pyramid shaping slowly, brick by brick, and brick by brick Talley had to change it. There were some men who were necessary—men who would create and build—men who should be saved.

Talley gave them what they needed.

But inevitably there were others whose ends were evil. Talley gave them, too, what the world needed—death.

Peter Talley had not asked for this terrible power. But the key had been put in his hands, and he dared not delegate such authority as this to any other man alive. Sometimes he made mistakes.

He had felt a little surer since the simile of the key had occurred to him. The key to the future. A key that had been laid in his hands.

Remembering that, he leaned back in his chair and reached for an old and well-worn book. It fell open easily at a familiar passage. Peter Talley's lips moved as he read the passage once again, in his room behind the shop on Park Avenue.

"And I say also unto thee. That thou art Peter— And I will give unto thee the keys of the kingdom of heaven—"

THE END.

Brass Tacks

Well, authors, how do you pronounce 'em? Murray Leinster, incidentally, is not Willy Ley.

My dear Mr. Campbell:

It was a beautiful Sunday afternoon, and I, just returned to the continent, was shivering in what native San Franciscans term a heat wave. My keen ear detected the first strains of the Orpheo, and following them I was led into an obscure secondhand bookshop. Inside I asked the routine question, hopelessly, of course; but; "Yes, we have a few. Not very old, but we do have a few."

Among these few back numbers there were Chapters I, II and IV of 'Slan." I write, however, not merely to tell you of my unbelievable good fortune, nor to tell you that I was disappointed, as a man must be disappointed in a work he has heard spoken of so often and so reverently for five years.

I have also a project to suggest. That, to facilitate scholarly discussion of the ideas presented in your periodical, you publish some sort of phonetic list of authors. Some of my friends, for instance, rhyme "van Vogt" with "Van Gogh," while others make it "van Vaught". Ordinarily a simple knowledge of languages would suffice for such a problem, but with Americans Anglicizations has set in so arbitrarily and so irregularly that one can never be sure, and moreover, so many of your names are pseudonyms with purely personal pronunciations that the matter makes reference difficult. Does "de Camp" rhyme with English verb "decamp"? For that matter, when we consider the personality of the author as we read it, there is some doubt as to whether he rhymes "Sprague" with "lake," "Hague," or even "ague". "Ley," of course, presents no difficulty (though there are those who make it 'Lee"), but where is the accent on his nom de plume? "Line-ster" or "Lin-ster"? "See-mak" or "Sai-mak"? And where is your accent on "Asimov"? Indeed, I even know people who have never heard the whole story of the team "Eando."

This is, of course, no immediate

difficulty. Virtually all of our discussion is by mail nowadays, and our women for the most part do not know one end of a deflatronic implematrix from the other, and so do not trouble much about it. The issue remains, however, as a vital postwar problem.

While you have obviously excellent reasons for considering the personal criticisms of your readers, I fail to see why your readers should be interested. While some of the post-mortems in Brass Tacks are original and provocative, the greater part are merely statements of preferences. Valuable to you, as I say—finger on the pulse and all that sort of thing—but I wonder that they should excite popular interest. However, since everyone else is pouring it on, I will tell you that Anson MacDonald's "Beyond This Horizon" was a great work. Not only the finest thing in the history of science-fiction, but were it a novel it would be the greatest novel of manners since the "Canterbury Tales".—John M. Campbell, Jr.

I'll bet a goodly number got incinerated for making predictions, though. Wrong predictions annoy potentates.

Dear John:

In R. S. Richardson's article "Prediction—Past Tense" the statement is made that "many an astronomer has been burnt at the stake because the authorities were convinced that (astronomical prediction) was witchcraft."

Not to condone the Inquisition and its Protestant equivalents in the slightest, or to deprecate Dr. Richardson's excellent articles, but just to keep the record straight, I don't think there are any cases on record of people whom we should call professional astronomers being burned because of their predictions. From 1200 to 1700, when most of the burnings too place, nearly everybody from the popes down believed in astrology, which predicted a lot more than mere astral movements.

The nearest to such a case was that of Cecco d'Ascoli, Professor of Astrology at the University of Bologna, burned as a heretic by the inquisition at Florence in 1327. Cecco's belief in the Antipodes may have contributed to the case against him. But in general his astrological and astronomical ideas were not radical for his time, and it is suspected that one of Cecco's numerous enemies was paying off a personal grudge.

Giordano Bruno was certainly burned in 1600. But, while his Corpernicanism was a contributing cause to his condemnation, the main reason was his voluminous religio-philosophical speculations with Neoplatonist tendencies.

Arnald of Villanova, Peter of Abano, and Galileo Galilei all had trouble with the Inquisition, but none was burned. The first two were primarily physicians, who dabbled in astrology and other forms of occultism. Arnald got off scot-free by curing the pope's gallstones; and Peter died in jail await-

ing trial. Galileo escaped by recantation.

For a time certain astronomical theories, such as Copernicanism, the Antipodes, and the non-supernatural nature of comets, certainly exposed those who professed them to molestation, loss of jobs, etcetera. Copernicus' book was not taken off the Catholic *Index* until 1835, and some Lutheran pastors were opposing Copernicanism into the present century. But there never was any wholesale burning of scientists.

The reason is not hard to see. Before Darwin and Pasteur, most scientific theories did not so flatly contradict Scripture that they could not be reconciled with a little ingenuity and "interpretation." And the solitary theorizer and stargazer presented no immediate economic threat to the Churches. But let anyone start a religious or magical cult of his own, and lure the people and their weekly contributions away from their rightful spiritual shepherds: that was a direct threat to the economic foundations of the True Faith. The most cruel and merciless repression that could be devised was not too bad for such scoundrels, who, regardless of how orthodox or altruistic their doctrines might be, were grilled in a hurry.—L. Sprague de Camp, Lansdowne, Penn.

But I think dwi-caesium and dwi-iodine would still be inimical enough to be dangerous!

Dear Mr. Campbell:

In regard to George O. Smith's "Danroda's Millions," I was just wondering about the explosion Wes Farrell caused on Venus Equilateral. Channing seemed to think that Farrell had put a couple of reacting blocks "side by each" and they'd gone off with plenty of force. But I think there might have been another factor. As we get farther down toward the bottom of the Atomic Table, the elements all begin to act more and more as metals, because as a bigger atom is built, the electrons are farther from the nucleus and are more easily lost, thereby giving rise to a positive valence. Granted, some of these extra-heavy elements might tend to react with each other, but I hardly think it would be violent. On the other hand, the heavier an element becomes, the less stable its nucleus. Using Mendeljeef's nomenclature, let us presume that We produced some eka-radium, a substance that, theoretically, at least, would be almost explosively radioactive. Now, when Farrell made the stuff, it was "brand new," that is, none of the atoms in it had yet exploded. But as soon as one of them reached the instability point, it went off, and gave rise to a violent chain reaction, which set off the whole block, or part of it. Part of it, more likely, because the whole thing wouldn't have left much of Venus Equilateral. Let us presume that the reaction would set off those atoms which were near the instability point only. That would inflict plenty of damage, but not enough to blow up all of the relay station.—G. R. Garrett.

Bob Heinlein has an itching typewriter, and a highly important war job. When he finishes the job, he plans to tell the tale of Rhysling.

Dear Mr. Campbell:

That matter transmitter of the Venus Equilateral boys is beginning to show its possibilities. Smith has hardly begun on them. For instance, somebody would be sure to try to make himself into an ersatz immortal man by making a record of himself when he was, say, twenty-five years old and then making a duplicate of his twenty-five-year-old self when he was fifty. He could then bring his duplicate up to date on history, social customs, science, etcetera. When he died his first duplicate could make a second either from the same record or from one made of himself after he had been informed by the original. In this, or a similar, manner there would always be one or two copies of the gentleman in circulation. He could even prevent himself from dying out accidentally by having an automatic set-up to make a duplicate of his most recent self after so many years if it was not shut off after one was prepared in the usual way. Of course there are all sorts of alluring possible complexities. For instance two of the duplicates might come to dislike each other, or one might pick an inconvenient time to go loopy. Our hero could have personal insurrections, so to speak.

Moreover, tricks like those in "Jason Sows Again"—which, you probably remember, ran in 1938—could be played with Channings' little gadget. How would it feel to have several hundred *yous* in circulation. It might be handy for getting rid of bad habits:

O wad some Pow'r the giftie gie us
To see oursels as ithers see us!
It wad frae mony a blunder free us,
And foolish notion:
What airs in dress an' gait wad lea'e us,
And e'en devotion!

—Burns.

And if you could get along pretty well with yourselves, you would be practically immune to death by accident. What matter if half a dozen duplicates die, or even the original, if sixty or so remain! It would also be handy in making decisions. Suppose you didn't know which of two ways of doing something would turn out better for you. You could try one and a freshly created duplicate the other. Which amounts to your taking both ways. Think how full a life you could live. You could have a duplicate follow up every interesting trail you found in life. *You* could be a specialist in every science there was, could spend your life appreciating the fine arts, could explore the solar system from rim to rim! An unlimited number of lifelines beginning in one individual and all crowded into one lifetime! It would be handy for populating new galaxies, too. Oh, that gadget would do more than ruin our economic set-up. A lot more!

With reference to Van Vogt's coming serial, I have selected only

one from the many remarks I would like to make: "Lo, these many years have I waited."

Padgett's new series seems to be deteriorating already. "Three Blind Mice" was good but not exceptional.

I liked Chandler's story. Science-fiction authors have dealt with practically everything else in the future; it's about time they got around to the literature. Speaking of which, is Heinlein still alive and intending to tell us about Rhysling, "the blind singer of the spaceways"? Frightful if he isn't, because only Van Vogt among contemporary s-f writers could approach him in excellence, and *he* hasn't been up to par lately. The permanent loss of Heinlein—and therefore Anson MacDonald, too—would be a sore blow indeed to most Astounding fans who have been around long enough to have an appreciation of him.

And finally, Simak should proceed from where he left off with the "Lobby," "City," "Huddling Place," "Census" series. It was far, far better than Padgett's current efforts. It was original in a most delightful manner.—William Bade, 2573 Dodge Street, Omaha, Nebraska.

Do you KNOW That, in a different region of space, with different field constants, other isotopes wouldn't be stable?

Dear Mr. Campbell:

Astounding dumped itself into a bucket of rather hot water when it

TROUBLE WITH A RED BEARD

They were the screwiest bunch Doc Savage had ever run across.

There was Disappointed Smith with a two-foot-long red beard—who was reported to have captured a German submarine single-handed. Then there was Mix Walden, the quarrelsome girl, and there was also the wheatfield blonde . . .

They led Doc on the wildest chase of his life on an island in the North Atlantic.

Be sure to read TROUBLE ON PARADE, a fast-moving novel in the November issue of

DOC SAVAGE
AT ALL NEWSSTANDS

published "The Ethical Equations," by Murray Leinster in the June issue. The story was certainly all right but when it started talking about isotopes that was too much. The elements simply don't react that way. Any of an element's isotopic forms that are not found on Earth are radioactive and have a very short half-life or in other words they rapidly disintegrate into either of their neighbor elements. Many isotopes similar to Leinster's Li^5, Gl^8, N^{13}, F^{18}, S^{3435}, and Fe^{55}, have been created artificially in the cyclotron.

If these atoms were the main building blocks of that extra solar spaceship, I doubt if Freddy would have found very much of the ship left as it was originally designed other than a mass of stable isotopes, the product of the original unstable ones. He would have found a slightly distorted hull of manganese, and the interior would be constructed of elements equally improbable and unusable for the particular purpose for which they were made.

Those isotopes would at absolute zero, still be radioactive nor would the addition of their stable brothers step up the atomic explosion.

I don't doubt that you'll get a number of other kicks on this same situation.—Donald Kingsbury, 22 Occom Ridge, Hanover, New Hampshire.

Hm-m-m. We'll sue, I guess. Accepting your own figure of 1134 c.c., gold, with the usual sp.g. of 19.3, weighs 21,886.2 grams, or about 47 pounds. Your gold seems to have a density of 365.058689 gms. c.c.

Dear Mr. Campbell:

In reading George O. Smith's story, "Pandora's Millions," I came across this amazing interlude on page 27:

"Doylen looked down at the brick. It was the size of a house-brick—but of pure gold. Stamped in the top surface were the words:

'99.99% pure gold. A souvenir of Fabriville.'

"'What means all this? stormed the reverend, waving the brick."

By means of a trusty ruler and a periodic table, I find that this volume—approximately 1134 c.c. of gold would weigh 413.976 55 grams. Or about 910.75 lb.

If I'm wrong, sue me, but it seems to me that the feat of waving half a ton about in the air is humanly impossible.

Aside from this, though, it's a swell story.—William Womack, 2976 Third Avenue, Huntington, West Virginia.

Psychology for Spacemen!

Dear Sir:

I would like to make some comments upon the present developments of rockets.

At the present time the major developments in rockets are being carried forward by the aircraft companies and affiliated organiza-

tions. The present effect of this, especially under the impetus of war, is rapid development of the rocket —the man-carrying rocket. However, in my opinion the prognosis is not too bright.

First these concerns will be interested in developing the rocket solely for their own ends, i.e. for the expansion of commercial air lines, and the increase of private flying, and for the most part these objectives are not consistent with the ideas the science-fictionists had in mind when they first started development of the rocket, and thus in the end will be of little real value, if indeed they are not an actual hindrance by sewing up some of the basic patents concerned.

Secondly, even if the aviation enthusiasts should take up the subject of interplanetary travel, they are not the men who are best equipped mentally to carry out its logical development since space travel is not an extension of aviation but a complete break from it. A man who thinks in terms of no point on the Earth's surface being more than sixty-eight hours away, would find it difficult to think in terms of the journey to Mars which requires two years. At the present some of them might be attracted by the journey to the Moon which only requires ninety-six hours but they would find it difficult to realize that with only a slightly greater amount of fuel the trip to Mars would also be possible.

Actually sailors, who are accustomed to planning trips that require long periods of time at sea, would in some ways be more suited to handle some of the details. Then there are some of the details that can at the present be best handled by the theoretical scientist. Thus space is conquered by a new type of man, one whose qualifications and training are different from those of any of the recognized types today. Thus the development of this new form of travel must not be entrusted to any of the recognized forms of travel. Also we must not make the same mistake here that we made with television. Although television has its uses, it will not live up to the great things that were originally anticipated for it. In the same way we must not make the mistake of waiting until space travel is developed to a high state of perfection before using it. And this is undoubtedly what would happen if it were left in the hands of the people who are now trying to get control of it. Instead it should be left in the hands of the people who originated it and who understand it and who will be able to see that it is developed to its fullest extent.—James L. Streiff, Midland, Texas.

———

Try Julius Unger, 6401—24th Avenue, Brooklyn, New York, for Old Astoundings and Unknowns.

Dear Mr. Campbell:

Having somehow endured those last few days before my magazine comes out, I hereby submit my ver-

sion of the Analytical Laboratory for the April, 1945, Astounding.

For first place I nominate:

"Destiny Times Three," by F. Leiber, by far the best in the issue. A good novel, it somehow lacked the suspense of "Conjure Wife" and "Gather, Darkness."

Next comes "Correspondence Course," by Raymond F. Jones. I don't know why I liked this so much. Maybe I was just in a good mood when I read it.

"Dead Hand," by Isaac Asimov is about up to the average of the "Foundation" series which is to say it is very good indeed. How about a two- or three-part serial when the "Foundation" finally gains control of the Galaxy?

"Brains For Bricks," by M. Jameson takes fourth place. This story was good but I liked the first of the series; "Alien Envoy," better.

Fifth comes "Vocation," by G. O. Smith. This was slightly similar to Van Vogt's "Asylum," with the high I.Q. morons, but it is a good story in its own right.

Congratulations! The article by Coupling is the best and most comprehensive one on the electron microscope I have read. I would like to see an article on crystals in Astounding. With the rotogravure section it should really be very good.

Incidentally, my favorite occupation on dark, stormy nights, or any kind of night for that matter, is reading Brass Tacks, something I seem to have been neglecting lately. Seriously, I do like to know that I'm not the only nut of this kind

No fan letter seems to be complete without criticism of the art work, but all of Astounding's illustrations look fine to me. An astronomical cover would look mighty good on the front of "my mag."

Would somebody *please* tell me where I can get copies of the earlier Astoundings and Unknowns? After eternities of grubbing in musty old book stores, I still lack vital issues. —Burns Macdonald.

Fred Nash is, as you might guess, a crypt analyst in his spare time!

Dear Mr. Campbell:

Did you notice the peculiar coincidence that the initial and final letters of the United Vacuum Fabricating Machinery Co. tool code words spell out—SUM FUN HEY KID? Well, it may be fun for the manufacturers and fabricators of ordinary vacuua, but not to me.

I think it is a conspiracy. What I need is gas-filled vacuua for thyratrons and glow lamps. But since they are soft enough to be squeezed into the tubes without machining, no one seems interested in supplying them. So, if you know where I can get gas-filled vacuua, particularly Argon Anhydride, please let me know.

For your private information, the UVFM Co. Waste Receiver will not hold anywhere near the rated fifty pounds of vacuum unless it has been compressed in a portable

baling press, which they do not catalogue as it is as yet only available in experimental models. And you know what that means.—Fred Nash, Long Island Division, Laboratory of Unnatural Science.

—

Service men overseas can subscribe, but they MUST SEND A WRITTEN REQUEST.

Dear Mr. Campbell:

There may not be a place for this letter in Brass Tacks. The technicians are doing well there, but just between the two of us and whoever else reads this letter: I always thought I appreciated Astounding but I never knew how much until the June issue reached me somewhere in the Pacific.

A Navy hospital corpsman attached to the Marines leads a very uncertain life; sometimes he's busy sometimes he has nothing to do, sometimes he is incapacitated.

I had too much fun reading the issue to find fault with anything; however, after some deliberation I have rated the stories in order of preference:

"Three Blind Mice,"
"Pandora's Millions,"
"Heir Apparent,"
"The Ethical Equations,"
"The Golden Journey,"
"Schedule."

Good luck to Astounding.—Rosco E. Wright.

TREASURE DIVIDED BY FOUR

Four men on a hunt for lost treasure—four matching quarters of a piece of eight representing the riches of a Spanish king.

When Claire Winslow inherited one quarter-of-eight, she didn't dream of the danger that lay ahead. Only The Shadow could foresee the future—to step into a plot brimming with disaster.

Read A QUARTER OF EIGHT, complete Shadow Novel, in the October issue of

THE SHADOW

AT ALL NEWSSTANDS

The World of Ā

(*Continued from page 98*)

armored tank. Its guns swung towards him. From some hidden point beyond the door, the voice of Jim Thorson called out:

"All right, Gosseyn, drop your weapons. And submit to a search."

There was nothing else to do. A moment later, the tank withdrew. And Thorson himself came through the door.

Somberly, Gosseyn eyed his enemy. It would be Thorson who was here rather than Crang or Prescott. Thorson who had tortured Gosseyn I, with all the pain memory still a living thing in the mind of Gosseyn II.

Looming giant of a man with gray-green eyes and strong heavy face and dominating hawk nose. Lips twisting the faintest bit, nostrils dilating and contracting as he breathed, his head bent slightly to the right, as he motioned Gosseyn to a chair.

He did not sit down himself. He said in a level voice:

"You'll be interested in the sequence of events. An instrument like the Distorter cannot, by its very nature, be detected when in operation. It's an active channel between the two objects to be similarized, and even the slightest interference would destroy the delicate balance. And so it was only when Blayney was questioned in a routine fashion about his escape, and the tactics used against him, that we discovered that Gosseyn himself was on Venus. Finding the Distorter was simple after that."

Gosseyn said nothing. This was scarcely the time to regret not having killed Blayney. The Ās had taken his mercy as natural and self-explanatory; and, even now that it had turned out badly, he could not see how he, being what he was, could have acted differently.

A philosophy that required the killing of people dangerous to you, was unsane to the point of madness. Gosseyn saw that Thorson's head was tilted even more to the right in an unconscious but intensely expressive hesitation. Without glancing at his hearer, the big man said

"Gosseyn, we've decided once more to change our tactics with you."

His head came down; his eyes gazed enigmatically into Gosseyn's. Gosseyn quivered to ask him what was happening, what *had* happened to the Venusians outside.

He left the question unspoken. He shrugged hopelessly. What was the good asking this huge, cynical creature anything? Whatever chance Armour and the others had, would grow out of their skill at using the forest as a cover. And the approaching darkness would be a special shield, hiding them from death.

Thorson was speaking again, an impatient note in his voice now, as if he was anxious to get these preliminaries over with:

"You've seen what's down under the meadow," he said harshly. "I have no doubt you and various Ā

experts have analyzed the meaning of that. If you have taken any hope from the analysis, dismiss it, for there is none, I assure you. The other galactic empires will not dare in the final issue to oppose the great Power, which I have the honor to represent.

"But never mind that! Gosseyn!"

Once more, the hesitation. Gosseyn had time to think: What is going on here? What plan can they have for me now?

"Gosseyn, this is going to sound awfully silly to you, perhaps even irrelevant. But have you ever wondered at the reality behind the existence of human beings in the plenum?"

The question must have been rhetorical. His eyes were slits of concentration, as he went on in an intense voice:

"Gosseyn, what would your explanation be for the fact that on every inhabited planet so far discovered in this galaxy, *the intelligent race is human,* varying only in color and racial characteristics due to climate and diet?"

For a moment, Gosseyn sat blank. And then, very slowly, he repeated the question in his own mind. Abruptly, the meaning struck him. Men! Relief came. Men, not aliens, were the enemies. The thought was a flood, a tidal wave, that swept along his nerves, engulfing him.

He grew warm with perspiration. Exhaustion came. Limply, he lay back in his chair. And the first sound beat into him at the extent of the fear tensions that had been in him, requiring surcease.

The wild emotion mounted its peak, and began to subside; and it was then Gosseyn discovered the depth of the cliff beyond. His relief drained into an abyss that had no bottom.

Men! What was he being glad about? No alien could ever surpass man in his iniquitous moments. The beast of beasts! Thing, creature, horror! Revulsion tore at Gosseyn's innards. Unsane men were the incarnations of brutality and lust. Murders, thieves, scoundrels indescribable— No crime was beyond their vaulting egos.

Unintegrated men! It was a synonym for beings that had never hesitated to destroy themselves, their kin, their kind. It was the epithet final, all-embracing, compleat.

The fever of feeling faded; and Gosseyn grew aware that Thorson was seating himself. It was not, he could see, an action of which the other was really aware. But simply a nervous gesture of his body. He sat down. He looked at Gosseyn. He said:

"Gosseyn! I have a tremendous reputation. I have been offered governorships of whole groups of star systems. But I've always felt that such positions tie a man down. I arrived in the Solar System only a few months ago, with orders to force the situation here. Crang and Prescott were the local agents, Crang the leader."

Restlessly, Thorson settled deeper into his chair.

"The presence of human beings everywhere has always puzzled me. For years and years I have been going around, looking at each new planet with a certain amount of amazement at finding human beings there too.

"I tried to think of their presence as evidence that a galactic civilization had existed in far gone days. But no scientist that I know of has ever been satisfied with that explanation. And do you know why, Gosseyn? Listen!"

He was leaning forward again, roused by his own words.

"Every inhabited system has different flora and fauna; at times the difference is literally radical; and yet on every planet there is a plausible connection between the animal and the human physique. The monkey on Earth has its entirely different but *apparently* explanatory parallel on each of tens of thousands of planets."

The giant smiled grimly. "Somebody, my friend, has gone to a lot of trouble. Let's begin by dismissing the word 'god' from our vocabuary; and then—

"Gosseyn!" His voice was thalamically intense. "How do you explain the coexistence of unique A and unique you in an otherwise ordinary plenum?

"Wait! Don't answer! There is no answer except the one I'm making. I still shudder every time I think of how wrongly we handled you, the only physical clue we have.

"First, we gave you death. That was bad. Even thinking in such terms showed on what a narrow basis we were making our identifications. Our next step was cunning, and that was a little better but not much. You will have to forgive our crude methods because we were so bowled over when you reappeared in a second body.

"Immortality!" He was leaning far forward, his face intent, his eyes slightly distended, as if he was re-experiencing an emotion that had rocked the foundations of his being. "Somebody had discovered the secret of human immortality. An immortality that is proof even against accidents. That is"—he paused contemptuously—"except the kind of accidents that can happen to bodies on Earth, where outsiders and their weapons have access everywhere."

Thorson paused; he swallowed hard; then:

"And still we were rationalizing on the basis of doing what we had been sent here to do. We know finally that League agents were in the Solar System; so our third move was double-purposed but also cunning: We released you to see whether they would accept that as a peace offering. Because, of course, under normal circumstances, we wouldn't dare to commit our government to opposing the League. As a warning to them, however, and as an arguing point in case they made an accusation before the next League meeting, we launched the attack against Venus on schedule. The details behind that move are too intricate to go into now.

"Our second purpose in releasing you was, we hoped you would

discover for yourself what this was all about. And then we could obtain the information from you. Because, of course, so long as you didn't succeed in training your extra-brain, sooner or later we would have captured you. You know that, don't you?"

"No!" said Gosseyn.

Thorson seemed not to hear. "All that is past. In the first place, the League agents must know that the League will never dare do anything against an empire of sixty thousand star systems. In the second place, Crang and Prescott and I have suddenly wakened, during this past twenty days, to the opportunity that is here. And now we don't care whether there is a galactic war or not.

He climbed to his feet. He paced back and forth.

"Our problem is this: Somebody has set the Solar System up as a laboratory for a new experiment. What the purpose of that experiment is, I can't imagine. Not military. The moment we attacked Venus, two hundred million Ās rushed out of their cities into the open. I never heard of such a thing."

He snorted, then grew calm. His eyes narrowed. "The experiment itself," he said slowly, thoughtfully, "is a failure, but the one unit of that experiment which doesn't seem to fit into the picture at all, is so important that the failure of the rest doesn't matter. That unit is you.

"Gosseyn!" Thorson paused tautly. "Somebody is playing a game too big for all the participants. And yet"—once more the giant hesitated—"he's weak, Gosseyn; he *must* be weak, or he'd come out into the open."

The big man's face was a study in calculation, in a tensed anticipation of action about to be taken. He said in a harsh voice:

"My friend, you and Crang and I are going to find him. We are going to force out of him the secret of immortality, and the secret of the extra-brain. We are going to destroy Ā completely because it is too dangerous to have around. And finally we are going to take over the control of the entire galaxy."

He finished: "In a minute, I'm going to take you down below the pit, and show you the strength we have here. The only question that remains is"—the gray-green eyes were like burning pools—"are you going to help us willingly or unwillingly?

"Help us you shall!"

Gosseyn nodded. "Willingly, of course. There is nothing else I can do."

They went through the now open, wood-veneered metal door into a corridor. It was a long corridor, but it was entirely taken up with elevator shafts.

"We decided," Thorson explained, "against using Similarity transportation even here where it could be destroyed in a minute." He smiled grimly. "Taking the Distorter to Earth, with its secrets, was risk enough."

Gosseyn was thinking of what

he had just agreed to do. He nodded at Thorson's words, but that was all.

The elevator they entered had distance-devouring qualities; and there was distance to devour. Gosseyn's intestinal fortitude strove to climb into his throat, and settled into position again only reluctantly as the acceleration ended.

But he hardly noticed that either.

It wasn't that he regretted his prompt acceptance of Thorson's plan. He *had* no recourse. He was convinced that Thorson had given him a reasonably accurate picture of the galactic civilization, as far as it went. The essence of it fitted with the analysis of the Venusians, even as to the part about the plenum being inhabited by human beings.

And even the final, unsane ambitions of Thorson and the others fitted. All scruples flung aside in the true unintegrate fashion, they were charging ahead now for purely personal reasons.

In such a deadly environment, Gilbert Gosseyn had to take chances. He felt inexorably determined. The being who had projected Gilbert Gosseyn onto the solar scene had better be able to protect himself. He had not hesitated to send Gosseyn into death situations. He had no business participating in such dangerous enterprises unless he could look out for himself under all circumstances.

"I'll help him at the critical moment," Gosseyn thought, tight-lipped, "if I can."

But, first, find him, *with anybody's help!* Discover his purposes. And, above everything else, advance himself.

Narrow-eyed, he looked at Thorson, said tensely:

"I hope you realize that the initial step *must* be to train my extra-brain. Are you prepared to carry your logic to that limit?"

"We are," said Thorson in a ringing voice; and Gosseyn stared at him, every nerve in his body tingling.

Thorson continued: "There'll be no delay either. Even what I'm going to show you now is connected. We're all here, Prescott, Crang, Dr. Kair—he was captured with all his data about you—and a number of Venusian solipsist psychologists, who will assist Kair and me in the actual training."

The big man broke off matter-of-factly: "As you know, I am a trained psychologist, except that I specialized in the physiology of the brain, not in methods of training and sanity."

He finished strongly: "I assure you, Gosseyn, we're going into this all the way. But before you build up any hope, consider the forces against you. *We* run this show."

Gosseyn had no intention of abandoning his hopes. But the elevator was stopping; and all thought ended briefly as his brain attempted to plummet down into his stomach.

He swallowed hard; and then, recovering, followed the mighty Thorson out into a shining corridor. They came presently to a large room lined with bunks, and swarming with young men.

So this was part of the great subterranean pit city. No question any more, it was a city, extending throughout hundreds of monstrous trees and down into the depths of the planet. To think he had once believed that Crang's apartment was all there was.

The hard ironic mood passed. Gosseyn became interested in his surroundings.

Mostly men surrounded him. Young men! They gaped at the newcomers with a childlike interest that had a curious obscene quality to it. And, like great sloppy children, they began to crowd forward after them. Gosseyn recognized them for what they were.

He saw that Thorson's eyes were watching him slantwise, with a saturnine amusement.

"This batch is worse than average," the giant said. "They're not exactly idiots, but they have many of the attributes.

"Look at them!" He waved his hand savagely at a group of wide-eyed individuals, who scattered at his movement like a flock of startled sheep. "Every year there's more of them. About six hundred years ago, we started a policy of killing, killing, killing, until now we're exterminating them at the rate of about a hundred and fifty billion per sidereal year. And still their numbers grow more overwhelming."

Gosseyn nodded. "They would. The larger and more advanced a civilization is, the more maladjustment there is. And then you people added the worst possible pressure: Fear of death. That breeds unintegration faster than any other force."

It was funny, but not until he had made the comment did realization come of what he was saying, of what he had heard. The color drained from his face.

"A hundred and fifty *billion* a year are killed alone!" he breathed. "Didn't you have any system of training?"

"I told you," said Thorson coolly. "A is unique. Nothing like it has has ever so much as been thought of elsewhere in the plenum."

"And you intend to destroy it!" said Gosseyn bitterly.

The big man made a curt let's-dismiss-the-subject movement with his arm. "We'll sit down over there," he said. "In my opinion, right here is where your training should begin. Do you agree?"

Gosseyn didn't even know what he was talking about. But he walked obediently over to the bunk indicated by Thorson. A long-legged creature scurried out of it as they approached. They sat down on the edge, and looked around them.

The scene was not so confused as it had been. The separate swarms of upleasant looking youths were flowing together into a semicircular mass that drew closer and closer to the two men. Curious eyes glistened at them. Thorson said softly:

"I want you to understand things. I want you to realize the situation. The presence of all these creatures goes back to an agent, who conceived the idea of giving Ā train-

ing to some of our condemned idiots."

The big man laughed. "Knowing something of his officialdom, he said he wanted the creatures alive for a special type of fertilizer to be made on the spot. Government Center never questioned that; and they've been arriving ever since.

"The training, Gosseyn, that that first batch received, was successful. The success was reported at the time, but don't ask me what galactic pigeonhole those reports were buried in."

Thorson laughed again, cynically this time. "Nothing was ever done. No one cares. The sheer mass of humanity in the galaxy makes it certain that no one ever will.

"The first agent decided finally to be satisfied merely with having extra assistants. He used them to enlarge the quarters around the pit. Most of his successors have carried on with his work. By the time Crang and Prescott arrived ten years ago, with orders to organize a revolution in time for the next League meeting, the organization was almost its present size; and its hugeness was suspected neither in the Solar System nor by our own government, nor by the League agents.

"Gosseyn!" The gray-green eyes were slyly confident. "I hope you realize that tens of thousands of men, who know only loyalty to this base, will be extremely valuable to our new purpose."

Gosseyn was realizing many things. He had his first numbing picture of the problem the invisible chess player was trying to solve: A galactic-sized nightmare of unintegration. But why couldn't he see what his own part must be? He sat cold and tense. Why couldn't he catch even a glimpse of the intended solution?

All he could see was defeat, growing greater by the hour.

He had been aware of the young men crowding closer, peering at Thorson and himself. Abruptly, the giant grimaced at Gosseyn.

"I've only been studying Ã a few months. What's the matter with these subnormals?

Gosseyn shrugged. "There are five stages in the growth of the cerebral cortex. The danger comes when an adult tangles up in one of the early stages. The first one is pitiful, organic in origin usually. Cretins, the results are called, if they grow up that way. They crawl into corners, and curl up in the shape that babies take in the womb.

"Most people get to the third or Narcissistic stage reasonably normal. But somehow, in the old days, and I presume right now in the Galaxy, getting out of that high school age complex proved generally impossible. A tiny minority reached the social or fourth stage, but they were overwhelmed by the vast majority of aging, ever more tangled fourteen-year-olds.

"These fellows"— Gosseyn motioned at the gawking audience— "are in the second stage, the autoerotic. It would be simple if they had just remained six-, seven-or eight-year-olds. But unfortunately,

the human nervous system either grows up normally or it gets messed up. There is no stopping." He paused, finished: "Is that what you want?"

Thorson stood frowning. Finally, without directly answering the question, he said:

"There's a schoolroom farther along, where some of these people are in training. I want you to see that, too."

Gosseyn followed, but he said: "I don't see how this is helping my extra-brain."

Thorson said: "I presume you've been trying to train yourself in some forest hideout." When Gosseyn nodded, he went on: "I don't know what method you used, but according to Dr. Kair you should start right down here, watching creatures like this, letting your mind *feel* their mental process, trying to think what goes on in their brains. And go on up from there, right through the entire Ā training. What do you think?"

Gosseyn was thinking that at least the system out in the mountains hadn't been wrong, though making the start at this low point was something that hadn't been possible among the highly integrated Venusians.

"Where's this schoolroom?" was all he said aloud.

It was not a large room; and the seats were arranged in a semicircle around a dais, on which were two three-foot cubes of wood, colored an uneven brown. There were forty "students" peering at the blocks and at the teacher.

The language the teacher was using was not of Earth, but it was easy to follow his meaning in his tones and in his actions.

The two blocks, he was saying, were not the same. Look! He bent down, and indicated with his fingers that one of them had a crack. And look! Here was a dark stain where the other one had light coloring.

Gosseyn could not suppress a grim smile. He knew that routine. Before these innocent, twisted minds got through with those blocks, the vague idea would have penetrated that the two blocks were DIFFERENT.

Even now, sometimes, it was astounding to realize that sanity depended on intensive training over a period of years in differentiation.

He was still thinking about it, when, abruptly, some of the students became aware of the newcomers. They leaped to their feet. The teacher shouted a threat, and they slunk back to their places.

The teacher said to Thorson in English: "May I use you and your companion to illustrate the next step?"

Thorson nodded. What followed was also simple, in spite of not knowing the language.

The teacher pointed at Thorson and Gosseyn. What are they, he asked unmistakably.

Men! Two men!

Well, yes, they're men. But they're men different from each other, different from all the other men in the world. It isn't enough just to be aware of that. You've

got to *realize* it with your mind and body as a whole. Can you name a difference between them?

One is bigger.

One has a gray suit.

One has brown hair.

One has green eyes.

Gosseyn didn't have to know the language to realize that their shrill voices would be pointing out the obvious differences between Thorson and himself.

He had to smile again, bleakly, as he thought of the nature of the inner differences between the giant and himself.

The Ā system would be hard put to find examples of more drastic differences between human beings.

"Naturally," Thorson's voice came from beside him, "we never give them too much training. But now, I think that's about enough for this afternoon. According to Kair, if we use the Distorter, it shouldn't take more than three or four days to get the first reaction."

It was on the fifth day that the two small blocks they used, flowed towards each other at the indiscernible velocity of Similarity. And touched.

XXI.

"It is not surprising that our language should be incapable of describing the processes occurring within the atoms, for, as has been remarked, it was invented to describe the experiences of every-day life, and these consist only of processes involving exceedingly large numbers of atoms."

W.H.

Gosseyn did not leave the dark room immediately. Instead, he leaned wearily back, and realized: Here it was. Here was the beginning. So what now?

He looked around the room. No hole in a tree was this training center. Dr. Kair had designed it, using all the available science of Earth and the Galaxy. He had asked hundreds of questions of pit technicians about galactic Similarity problems.

The impressive result was around him. The room was lined with electronic absorber tubes that were 99.-99 plus percent efficient. Vibrations, all except heat impulses, that touched those walls, were snatched up and never heard or seen or felt again except in infinitesimal ghostly form.

The temperature was controlled by an electron thermostat deliberately held down to react to one thousandth of a degree variation. Since heat was only one factor in many millions, that was considered perfect.

And it was but a beginning. At that point, the Distorter took up the intricate job. It similarized the two blocks to nineteen decimal places. It quieted the molecular movement of the air, partially similarized the table on which the blocks rested, the chair on which Gosseyn sat, the light waves used to shine on the blocks, the floor, the ceiling—and himself.

The whole task of similarizing the blocks this first time was almost completely a mechanical job. Nevertheless, it was he who had provided

the tiny extra impetus that had brought them together.

After five minutes, Gosseyn's meditations had arrived nowhere. Here was the beginning of success; and there was nothing to do or to think. His only choice was to refuse to go on. And, as Dr. Kair and he had agreed, he could do that just as easily at a much later period in his training.

They were waiting for him with the usual equipment when he finally went out into the laboratory adjoining the training room. The lie detector made futile any hope he might have had under other circumstances of fooling them. Gosseyn didn't even try.

The tests took longer than usual; both Kair and Thorson were excited by the thousands of tiny impulse lines that had reached up into the extra-brain; the first indication that more than just stay-alive energy had flown up into it.

Later, he was walking along a corridor, Gosseyn noticed that, in addition to his usual guards, a small tank was floating after him.

Prescott, who was in charge of the guards, caught his glance.

"It contains a vibrator," he explained coolly. "It will be used to make tiny changes in the atomic structure of the walls, ceilings, floors, ground—everything—wherever you've been. It will follow you from now on right to your apartment door."

His tone grew astoundingly savage: "It is a precaution against the time when you will be able to transport yourself from your apartment to any piece of matter, the structure of which you have previously 'memorized'."

Gosseyn did not answer, merely stood there looking at his enemy. And his steady gaze must have had some effect. The passion faded from Prescott's face. But there was a significant note in his voice, as he looked at his watch, smiled twistedly, and finished strongly:

"It is our purpose, Gosseyn, to tie you down with every means available to us. To that end, we have prepared a little surprise for you. It is now nearly midnight. You may return to your apartment."

Gosseyn frowned over those final words, as he climbed into the elevator, that took him up to the level of his apartment. He switched on the living room light, but not those in the bedroom; and he was in the act of undressing when he caught a movement on the enshadowed bed next to his own.

A surprised, sleepy face came up from the pillow. It was rather a lovely, delicate face, in spite of its startled expression; and even in the half-dark, Gosseyn recognized who it was. He stiffened. The girl sat up, and:

"You!" said Patricia Hardie.

"But," puzzled Gosseyn finally, "how did they get the idea of putting us together?"

"They questioned me with a lie detector." Patricia Hardie laughed as she spoke, a friendly laughter untainted by the slightest embarrassment.

"But I thought you could get around lie detectors."

"Only when he is nearby."

"Only . . . when . . . what?" Gosseyn stared at her, rigid. Then gasped: "Do you mean to tell me that the invisible chess player was nearby the night you came to the vacant lot to kill me?"

"Yes."

The blood was pounding in his temples. He was only dimly conscious of rising, of plunking himself down on the edge of her bed, of fiercely grasping her warm, bare shoulders.

"Why didn't you tell me?"

He began to quiver; he removed his trembling hands from her flesh. He sat there, picturing a shadowed human shape standing in the darkness a hundred, two hundred feet from where he had caught Patricia Hardie that night.

Slowly, his tensed muscles, his straining nerves relaxed. Because she was here. At last he was in a position to ask all the questions he could think of. But start at the beginning. He said slowly:

"Crang and the others found out you were my wife?"

"Yes."

Gosseyn parted his lips for his next question, and then closed them again. Wife? It hadn't struck him before, but he and this—strange—woman were in the same bedroom.

He stared down at her sardonically. Patricia Hardie must have understood his silence; for she said with a quiet understanding:

"As far as our personal relationship is concerned, my own attitude is very simple: I know that I'm your wife; I remember the whole of our married existence. I know, however, that you don't remember. If you want me, you'll have to court me again. I assure you, it will take time to convince me you feel anything more than physical attraction. And that isn't enough."

She finished: "Apparently, we're to live in the same apartment. So turn out the light, get undressed, and go to bed."

A man and a woman speaking to each other in darkness:

"Patricia."

"Yes?"

"Who's behind all this?"

"I don't know. A bearded man."

"You saw him?"

"Don't ask me who he is, or what he is. He came to us just after I had been killed in a plane accident."

"Killed! Then I *was* a widower."

She sighed in the darkness. "That was long ago, thirty, nearly thirty-five years. We're an old married couple, and we'd be well into null-Ā middle age but for him. It took all that time for our new bodies to grow."

"You mean"—it hadn't struck Gosseyn before—"he could give you a second body even after you died?"

"It depended, he said, on how quickly he got hold of the body."

"What did he do?" Swiftly.

"I don't know."

"Oh!" A pause. "You said, *our* new bodies!"

"Even though you weren't in the crash, you had to have a new body

to keep our ages level. You made an agreement with him. You had to, to save me. I don't know what happened, but here you are—younger."

"A pact with the devil!" said Gosseyn, slowly.

"He's no devil."

"No, I know."

How well he was beginning to know. Minute by minute, the picture was clearing. The tremendous picture of an attempt by a being with apparently limited powers to save the sanity of the intelligent life of the Universe. And the great crisis was here in the Solar System.

"What makes you think," Gosseyn asked, "that in reconstituting you in a second body, he didn't fool you as badly as he did me?"

The darkness pressed heavily around the question. Finally:

"I've thought of that," said Patricia Hardie. "But I don't believe it. It wasn't necessary in my case."

"Nevertheless, it's a possibility?"

"Yes."

Silence; then:

"Why," Gosseyn asked, "didn't you give me some kind of warning when you first came to me?"

"I was wearing a locket dictaphone, and Thorson was listening in at the other end. Besides, you weren't supposed to know anything."

"What am I supposed to do now?"

"Escape, I suppose."

"You don't know?"

"No."

"You've had no more communication with him?"

"None."

Long after her slow breathing showed she was asleep, he lay awake. And grimmer he grew,

more alarmed. The world of his hopes was narrowed down to one lone being working with the help of a few uncomprehending assistants like himself—against the colossal might of a violently unsane, all-embracing galactic civilization.

And there was nothing to do. But go on. And hope.

It was two days after that that Gosseyn bent two light beams together. By then the curious intense tingles had started in his nervous system: the gathering sensitivity of his whole being to a new awareness of its environment.

They were not pain, those tingles. They were automatic attunements. No, not even that. They were unconscious attempts at attunement, as far as his body could go without the conscious help of his extra-brain.

He *felt* energies, movements, things. The presence of other men was a warm fire along his nerves. He responded to the most delicate impulses, and by the sixth day, he could distinguish Dr. Kair from the others by a "friendliness" that exuded from the man. There was an overtone of anxiety in the psychologist's feeling, but that only accentuated the friendliness.

It was vaguely interesting to Gosseyn to distinguish between the emotions felt about him by Crang, Prescott and Thorson. He was rather amazed to discover that it was Prescott who disliked him violently.

Gosseyn thought darkly: "He's never forgotten the scare I gave him in Dr. Kair's living room, and the fact that I fooled him again when I went to the palace to get the Distorter."

Thorson and Crang were Machiavellians; and their feeling about him was neither dislike nor like. It was caution, a steely determination to use him.

On the eighth day, he was permitted to examine a piece of wood, and then taken some distance from it. He spent minutes thinking of the similarity between it and himself. Abruptly, the distance—between himself and it—was bridged.

That afternoon he made a very careful attempt to counteract the vibrator.

Its intricacy startled him. It was a thing of many subtly different energies. Pulsations poured from it on so many wave lengths that only the absolute necessity of doing *something* made him stick grimly to his purpose.

He succeeded because it was a small machine, its various parts close together in space-time. The time difference between the innumerable functions was not a factor.

And that was why the control meant nothing so far as his escape was concerned. The time factor *was* important when, holding the vibrator, he tried simultaneously to memorize the structure of the section of a floor.

He couldn't dominate both.

That situation continued. He could control the vibrator OR the floor, never the two of them together. The gang knew its Similarity science; that was finally clear.

He made several attempts to read their minds. But though vague phantasms of pictures flitted through him, it grew apparent that the brain of another human being was too complicated for him to dominate at this early stage of his training.

A superman caught and held in a trap. A trap that was hard to maintain, it was true. But that only made the future darker. Because of that difficulty, they would have to kill him in the long run. No one would go permanently to so much trouble.

They were curious, unreal days that preceded the climax. On the nineteenth day, he was given a metal rod with a concave cup made of electron steel, the metal used for atomic energy. Gingerly, Gosseyn reached with his mind for the small electric power source that had been brought into the room.

The sparkling force coruscated in the energy cup, and spat with a hazy violence against the floor, the wall, the transparent shield behind which the observers waited. Shuddering, Gosseyn broke the twenty-decimal similarity between the rod and the energy source.

He surrendered the rod to a soldier who was sent out to take it from him. Not till then did Thorson come out. The big man was genial:

"Well, Gosseyn," he said, "I think that's about all the training we're going to give you. Accordingly, your big moment has arrived.

"We're leaving for Earth within the hour. Your wife will remain here as a hostage. We're going to follow your back trails, asking you all relevant questions at key points, in the belief that something will occur to you. That's only the first step, mind you. But there *must* be a clue somewhere along the line as to the present whereabouts of the invisible chess player."

There was.

XXII.

"I am the family face.
Flesh perishes, I live on,
Projecting trait and trace
Through time to times anon,
And leaping from place to place
Over oblivion."

Anonymous

The palace was a shattered, empty husk. Gosseyn wandered with the others along its bare corridors and through its smashed rooms with a nostalgic sense of a civilization going down and down.

The firing in the distant streets was a throbbing background to his movements, a continuous, unpleasant mutter, irritating, polysonal.

The wall, in Patricia's room, where the Distorter had been, gaped at them. The unbreakable French windows lay shattered on the floor. Through the empty frames, Gosseyn stared out towards where the Games Machine had once towered like a jewel crowning the green earth.

Where it had been, thousands and thousands of truckloads of dirt had been dumped, perhaps with the intention of leveling all traces of the

symbol of a world's sanity. Only no leveler was at work. The dark, unsightly earth lay multitudinously humped, and seemingly forgotten.

It was a picture of desolation.

There was no clue that they could find in the palace; and the whole mass of men and machines headed for Dan Lyttle's house. It was on the gang's side of the battle lines; and miraculously it stood untouched. The automatic electronic de-dusters had kept it spic and span; the rooms smelled as fresh and clean as he had left them.

The crate, in which the Distorter had been, stood in one corner of the living room. The address, to which the Games Machine had intended it to be sent, was huge on the side that faced the room:

THE SEMANTIC INSTITUTE

The *what!*

Gosseyn's brain reeled as he stared at the words; and then, instantly, remembering his situation, he turned calmly away. But a few minutes later, the lie detector coldly revealed the thought he had had.

There was excitement in Thorson's manner. "By heaven!" he cried, "that's it! Where else could he be? Where else could *they* be? General!"

"Yes, sir!" A uniformed officer sprang to attention.

"Radio Venus; let Crang and Prescott know what we've discovered. Keep them in touch."

He whirled, a great tigerish man. "Let's go! And, guards! Keep that vibrator in operation and under guard."

"Yessir!"

An armored army moved along the streets. Fleets of planes rode the sky. Above them, spaceships hovered, ready for anything.

Robotanks and fast cars swarmed ahead along all nearby streets. They raced in silent processions into the famous square; and then men and machines poured into the building through the doors from every direction.

At the many-doored, ornamental main entrance, Thorson indicated the letters carved in the marble. Somberly, Gosseyn paused, and read the ancient inscription:

WORDS, AH, WORDS

It was like a sigh across the centuries. All the reality of meaning, as it affected the human nervous system, was in that phrase. Countless billions of people had lived and died without ever suspecting that every word they spoke, or that was spoken at them, had helped to create the disordered brains with which they confronted the realities of their worlds.

Confusion at one of the doors interrupted his thought. A dozen gang officers came out, escorting a heavily built middle-aged man. The man was angry.

"Mr. Thorson," he snapped, "will you kindly explain this outrage?"

Thorson sauntered forward. "Who are you?" he said insolently.

With trembling fingers, the man

produced a medal that glittered with jewels. Thorson stared at it with curling lips. He turned at last to Gosseyn.

"This is an agent," he said, "of the League; and this should no doubt be a very impressive moment. I have a suspicion we've come upon them when they least expected it."

It was more than a suspicion with Gosseyn. He could feel the League agent's bewilderment and alarm. Thorson's tantalizing voice came again:

"Professor, if you were going to hide a human body, wouldn't you think that a school, a place where there are a lot of schoolteachers, people still regarded as impractical folk in spite of all they'd done—wouldn't you think that would be a good place?"

He went on, still in that playful tone: "For instance, the medical department of the Semantic Institute in this city alone contains, I have just been informed, thousands of bodies in its vaults. Oddly, so I was informed a few minutes ago, it was one of the places hit by a stray shell. What a strange coincidence!"

He broke off arrogantly: "But now, don't you think you'd better take us inside?"

They came presently to a large room, where a number of men were waiting under guard. Others arrived, under escort, even as Gosseyn started to look around. A guard's officer said:

"All these fellows had private offices!"

Not counting the guards, Thorson or Gosseyn, fifteen men were finally present.

The plump man was slowly recovering. His nerves stopped giving off shock pulsations. His face lost its feverish aspect. For the tenth time, he wiped the perspiration from his brow; and this time it stayed wiped. He said in a threatening voice:

"You at least, Mr. Thorson, will suffer for this. When I report to my superiors how we have been treated, they will take up the matter with your foreign office, and then—"

Thorson was laughing. It was a quiet laugh, but it had deadly overtones:

"You know, Gosseyn, I'm kind of in a predicament. I have no desire to have my government step on my neck before I have a chance to investigate this whole business. Which will undoubtedly take several years. At the same time I've got to get rid of Ā and of all the people who are dangerous to me, or who know too much."

His amused eyes met Gosseyn's. Before he could speak again, the plump man said scathingly:

"You poor fool! Destroy Ā indeed! Haven't you realized yet that Ā cannot be destroyed? Haven't you drawn the proper conclusions from what is happening?"

"What do you mean?" Sharply.

"Listen!" The League official was earnest, confident. "A planet was attacked, with complete surprise achieved. Immediately all its inhabitants, two hundred million of

them, did everything necessary to frustrate the enemy. In this case they headed into the open country, out of the attacked towns. That was one of the great moments in the history of the Galaxy."

He went on proudly: "Do you realize that conquest has been possible in the past because the mass of a people clung to their strips of land, their homes? And that so long as the conqueror took only taxes, they accepted his overlordship. But now, at last, there is an educational system in which each individual, deciding for himself alone, automatically acts to foil forever the machinations of the militarists. For generations, the League secretariat has searched for such a system; and now—"

Thorson cut him off, with a savage satiric remark to Gosseyn:

"I forgot to tell you, Gosseyn, the permanent secretariat of the League is a very enlightened body, which spends most of its time trying to make sense out of the mouthings of the very unenlightened delegates."

He laughed uproariously; then he calmed, and scowled.

"Look!" he said. "At the next League meeting, which is due in a year, my people will ask for the Solar System outright; and one of their arguments will be: There's a war on. Law and order must be restored.

"Do you think," he roared, "those muling hypocrites are going to inquire into the reasons for that war, if there's no evidence?"

The plump man shrugged. "What you say is all too true. A would win in the long run of course, by the simple process of being undefeatable. But that is where Professor Lavoisseur's development of the extra-brain in Gilbert Gosseyn comes in: It will prevent long drawn-out bloody struggles due to the stubbornness of individual leaders such as yourself and your colleagues."

Thorson's smile showed his teeth. "There's only one thing wrong with that. We've got Gosseyn—and under firm control, I assure you."

He turned slowly, and his fierce gaze flicked over the faces of the councilors. He said at last with a mock politeness:

"And which, may I ask, is Professor La—" He stopped, and then said sharply: "Lavoisseur! Did you say, Lavoisseur?"

His eyes narrowed. "So that's it," he said through clenched teeth. "He had an extra body, too, did he? Well, well, well!"

His smile was a grimace: "At last, Gosseyn, we're catching up to reality. As for the rest of you . . . General!"

"Yes, sir?"

"Ask these gentlemen the questions on the list I gave you, have them swear to it on a lie detector. And then"—he straightened slowly—"shoot them!"

He headed for the door. "Now, where is the medical department? And Professor Lavoisseur?"

Gosseyn was cold with that cold which derives from the nervous system. The crisis had come so swiftly

that it was hard to grasp the interplay of arguments that had flashed past his head. All that was clear was that Thorson had recognized the name of Lavoisseur, Thorson was going through with his plans. Thorson had no doubts.

Surely, surely, Gosseyn thought, Lavoisseur, whoever he was, must have something up his sleeve, some weapon in his laboratory. *Something!*

They found a tall bearded man sitting at a desk in a large room filled with glass cases, in which were human bodies. Soldiers ransacked the place; technicians examined every machine. Rays tested the walls, the ceilings, the floors.

Professor Lavoisseur remained sitting in his chair. There was a tensed expression on his face! and it was at that face that Gosseyn stared over Thorson's shoulder. There was something familiar about it—outlines under the concealing beard.

Even with the beard, the man was magnificent, obviously an A of the highest type.

Thorson stepped through the doorway, inside the room; and Lavoisseur's flicking gaze lighted for the first time on Gosseyn.

He stiffened perceptibly. His eyes widened the slightest bit. Even in that roomful of organic and inorganic energies, the alarm that pulsated through his nervous system came through to Gosseyn. And then, just like that, he had control of himself. He smiled; he bowed slightly; he said:

"Hello, Gilbert Gosseyn!"

It was his voice that completed the recognition cycle. His deep bass voice. Gosseyn's memory leaped back to other moments when he had heard that strong voice, and to the time when Prescott had almost revealed the identity of the monstrosity gang leader. "La—" Prescott had began, "La—"

"'X'" Gosseyn cried.

Almost, Gosseyn couldn't get over it. "X" the abnormal, the human thing that had been nearly all plastic—whole now. He grew aware that "X" was rising to his feet. The man's deep voice said something about it having been no pleasure to be a monster—a deliberate surgical operation, part of a tactics of employing "every possible device to fool our powerful enemies.

"Apparently"— Lavoisseur's smile was grim—"we didn't fool them as much as we thought. In all advance picturings of such an eventuality as their coming here, I never expected they would take the risk of bringing you along."

Gosseyn hardly heard. Once more, he was looking around, desperate now, for something, anything, that would make a fight possible.

But all he ran into was the fantastically confusing whisperings of the vibrator—inside an armored tank, floating in the center of the room. Wretched, deadly thing, imprisoning him!

Lavoisseur was saying something to a narrow-eyed Thorson about "explaining the principles of im-

mortality. If you and Gosseyn will follow me—"

It was hard to listen at first, hard even to look at the glass cases and the machines, which Lavoisseur-"X" was using as illustrations for his explanation. It wasn't that he wasn't anxious to learn the facts. But the weight of defeat rested so heavily on him that no words had any real meaning. Once he thought in amazement: Was the once-invisible chess player actually explaining his system to Thorson?

In spite of his terrible distraction, the great voice of "X" kept pushing through; and slowly interest came, absorption came, defying all the tensions in his nervous system:

"The secret of human immortality involves the isolation in an individual of the duplicate potentials he inherited from his parents. The important feature is that in every person this duplicate potential from both his parents divides and grows endlessly. By removing it from the body it can be made to grow into an embryo, a baby, child, youth, adult."

"X" paused and looked at his hearers with his keen eyes. Then he went on:

"Theoretically, all this could happen in a normal birth. But actually not even identical twins can ordinarily have the same experiences even while in their mother's body. And, once born, they diverge beyond all the requirements of similarity. As children they are startlingly alike, but they eat differently, have slightly different experiences; they even breath different air. Their metabolism changes continuously; and their thoughts vary ever more widely.

"Only under laboratory conditions, kept unconscious by automatic hypno drugs in an electronic incubator can a proper environment be maintained for the bodies. There, without any thoughts of their own, their muscles massaged by the machines you can see, fed on a perfect liquid diet, their bodies change slightly from the original, but their minds change only according to the thoughts they receive from their alter ego, who is out in the world.

"And so, because of this thought similarity, while actually death strikes body after body, the same personality *seems* to go on."

Gosseyn's eyes were taking in the room again; the glass cases, the lifelike bodies in them, the soldiers standing around alertly, their automatic guns ready. And continuously, there was the special tingling of his nervous system, responding to the thousand pulsing forces all around him: human, electronic, atomic, neural, electric, magnetic, physomic, semantic.

And still there was nothing that he could see or feel or think, that would help them. The thought that did come was: "He's only human . . . with all the limitations of the human nervous system—" Surprised now by overwhelming force.

He was aware of Lavoisseur-"X" saying something about a device similarized to control "even the nature of the thoughts that are received by the unconscious duplicates."

A blazing fury swept Gosseyn. This verbose fool telling all his secrets. Didn't he realize that even Earth science would need only the general explanation, the idea, of something so relatively simple as the immortality he had discovered.

"I had to explain it, Gosseyn, for your sake, just in case—"

Gosseyn jumped as if he had been struck. No words had been spoken, yet the thought had come into his mind as clearly as if he had had it himself.

He whirled towards "X", as the man said mildly: "The extra-brain —I'm sorry, that was an accident of birth, a mutation, which happened long ago, and which I have kept alive. I have not, however, been able to reproduce it except by my system of immortality, started from the original body."

Thorson's voice roared out: "That's a lie. Why, there's Gosseyn here with it and you yourself must—"

He stopped. A startled look came into his face.

"Gosseyn, go over and sit in the chair at my desk. Every metal case in this room, in this building, has an energy cup in it."

"But—" protested Gosseyn.

"HURRY!"

Sitting in the chair, Gosseyn looked around him shakily. If there was only something he could do! He was aware of a profusely perspiring Thorson bellowing orders; and the thought came that this confusion, this excitement, must be a normal finale to the ambitions of individual men.

Always, the final crisis in human life must be intensely personal.

"Gosseyn, nullify the vibrator!"

Gosseyn was thinking about the fact that Prescott had been wrong. It WAS possible to establish sufficient similarity with another human brain for telepathic purposes, and yet— He had the distinct and awful feeling that he was missing a vital point ,still.

"Nullify the vibrator!"

Abruptly, there was no time to think. His whole body pulsed with energy as he became attuned to the vibrator. His vision blurred. He had a vague glimpse of fire striking from nowhere in the great Similarity fashion, straight at Thorson.

The big man went down, his head sheared off by a bolt of stupendous force. All around, gang men were falling, screaming, scrambling for the door. A fireball engulfed the tank with the vibrator, and tore it, and the men manning it into shreds.

The dreadful weight of vibratory pulsations cleared from Gosseyn's nerves. With a start, he saw that Lavoisseur-"X" was writhing on the floor, his body smoldering in a pool of blood.

There was too much confusion. Way back in Gosseyn's mind was the first sickening realization of what this man's death could mean. And then:

"Gosseyn, hurry. Don't let them recover. Don't give them a chance to advise the planes above to bomb. Clear the building, then come back here.

"Hurry!"

Gosseyn hurried. He had an ash-throated conviction now that the other man had not long to live. He snatched for a source of power—and in ten minutes wrecked the building. Corridors were seared with the murderous fire he poured along them. Walls caved in on shouting men.

"No one!" Almost like pure fire was the thought. "No member of the gang must get away."

They didn't. A division of men and machines had swarmed into the square. Torn, blackened bodies, smashed metal was all that remained.

He looked up from one of the doorways. The planes were hovering at a thousand feet. Without orders from Thorson, they would hesitate, for a while at least, to bomb.

They might land, of course. But that was fine. He'd guarantee to handle anybody who was foolhardy enough to come down.

He felt a savage sense of invincible power; and then memory came of the fear he had had. He raced back the way he had come.

As he re-entered the laboratory, Gosseyn stopped short. He stood staring down at "X", and he swallowed hard. With an abrupt jerky movement, he knelt, and listened at the still heart. Slowly, he climbed to his feet. And he was thinking, and his lips were forming the unspoken words:

"But you didn't explain anything, actually. I'm in the dark about all the main points."

The thought quieted reluctantly, because a realization came that this was life itself he was experiencing. Life in which nothing was ever finally explained.

He was free, and this was victory.

He began urgently to explore the room. But that didn't take long. There had been a series of filing cabinets along one wall. They were smashed beyond salvage, a fusion of metal and paper, not burned or blackened, but squashed into a solid mass that wouldn't come apart coherently.

The desk had fared somewhat better, but the papers in it were data sheets, case histories with names, file references, and were largely devoted to numbers having electronic connotations. The occasional word were merely an identification directive.

The plastic cabinets containing the bodies were, with one exception, intact. That one had been hit by a slab of flying metal which was buried deep in the left side of the body.

There was nothing anywhere to indicate who or what they were.

He went along the corridor to the room where the League agents had been herded. A dead soldier sprawled in the doorway, and the room itself was a wreck from gunfire. Men lay with their faces shot away, or burned. Gosseyn counted thirty-nine in all, and realized with a gruesome satisfaction that the dead League agents had been revenged within minutes.

And still he had no information, nothing to fill the great gap in his mind.

He thought blankly: "I've got to get out of here. Get out."

He started towards the distant exit; and he was halfway there, when the realization came that he *couldn't* leave.

If he went away from here now, he'd never dare come back. The kind of freedom he had won didn't permit entering possible traps, where other vibrators might be waiting. Slowly, he retraced his steps, and once more stood staring down at "X".

The dead, impassive face seemed to mock his lust for information. Mindless, he thought bitterly.

He stopped. It was the pause, he realized, the standing and staring that had made it possible. The corticalthalamic pause, so easy for him these days, and yet not quite automatic. He could still rush about for hours on end without remembering to exercise its magic powers of solving problems.

But—mindless? Not yet! The cells of the human brain were extremely mortal, but they didn't die immediately after death. It all depended on how much time had passed and—

Gosseyn felt a pang of anxiety. Nearly an hour, *at least* three quarters of an hour, had flown by.

The brain would be far gone indeed. And yet—that was still a puzzle—"X" had managed to similarize it with Gosseyn's, and it must still be in very close attunement.

What was not dead, should still be similarizable. The minutes fled. Gosseyn began to sweat. It was the intricate process of dying, he thought, that was causing the delay. It had already partially destroyed some of the similarity that "X" had established between them. Hurry—or lose his chance forever.

Abruptly, he made his first connection: A thought, not his own, came violently:

"Gosseyn, our powerful enemy—"

That was all, but Gosseyn thrilled. He must have struck a tiny mass of cells. Once again, the minutes flowed by; and then:

"The immortality was the original discovery; the extra-brain came when one of the earlier bodies was being developed—an accident of mutation. That was long ago. There were several bad results of that accident and—"

Frantically, Gosseyn fought to hold the connection, but there was a blur, and then nothing. What was clearer was the realization of the extent of the disintegration. The cells were losing their unity of personality. Wild cells remained, bewildered groups, masses of neurons, holding their separate pictures unsteadily against the encroaching deadness.

And still he knew nothing that was important. He counted his hopes now in terms of minutes.

For a brief moment then, as he strained to similarize, Gosseyn was conscious of the fantastic thing he was doing. He pictured himself in this almost shattered building, with enemy planes and spaceships circling overhead like vultures, trying to read the mind of a dead man.

Surely, in all the universe—this was unique.

The personal thought faded because, once more—contact:

"Gosseyn, when you are free, take no chances. Do not even try to . . . (Blurred) . . . until you have developed more bodies . . . When you married Patricia Hardie, not knowing who you were . . . I found that was the best method, for the bodies not to know. Because each one had its own ego, and wanted to . . . (Blurred) It's a good idea to have several bodies out at the same time, but be sure to keep them less than you are . . . as I did with 'X' and of course with . . . (Blurred)

"I had to have somebody in the gang as an observer, and so 'X' had to appear to outdo them in bloodthirstiness . . . Gosseyn, one of us had to die in this unexpected crisis; and I'm old—"

There was a pause, a distinct pain impression; and then once more thought:

"Gosseyn, more than five hundred years ago, I had the secret of immortality . . . I nourished Ā, which was then like a tiny flowering plant in a wilderness of weeds. By the time I went to Venus, I had the mutated brain; and so I discovered the secret galactic base. Using their scientific knowledge, I superintended the construction of the Games Machine—because only a machine could in the beginning control the undisciplined hordes that lived on Earth. Then I visited the stars.

"I came back . . . and found far advanced a plot to destroy Ā. I discovered that there was . . . (Blurred)"

It faded there. And that was all he got. Minutes and minutes he strained, and there was nothing but an occasional blur.

Gosseyn climbed slowly to his feet. Except for one thing, he was satisfied. It was more than that. He felt the triumphant glow of a man who had triumphed over death itself. The picture as a whole was clearer; he knew what the dead man had tried to do, and why.

After a moment, the exception began to bother Gosseyn. It had been vague, but now it came to the fore, product of an overtone of picture that had come from "X"'s brain.

"I'm crazy," Gosseyn decided, suddenly shaky. "He couldn't have meant that."

But the other things began to fit, the very fact that mental telepathy had been possible— Feverishly, he went in search of some Beardex salve, found it in a nearby washroom; and, returning, rubbed it with trembling fingers over the beard of that still, dead face.

The beard came off easily into a towel. Gosseyn knelt there looking down at a face that was older than he had thought, seventy possibly eighty years old.

It was an unmistakable face, and of itself answered many questions. Here, beyond all argument, was the visible end-reality of his search.

The face was his own.

THE END.

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